Paper TRADE JOURNAL

VOLUME 127, NO. 25 DECEMBER 16, 1948

WOOD PULP

G

Established 1886

"The year is all but done."
CHARLES KINGSLEY

Sixty-three year-ends have passed in the course of our close and happy association with Pulp and Paper.

With full faith and through the ebb and flow of these years we have never wavered in our confidence in the ability and manifest destiny of American papermaking.

It is our desire and intention to remain geared in organization and facilities to the increasing needs of an ever-growing industry.

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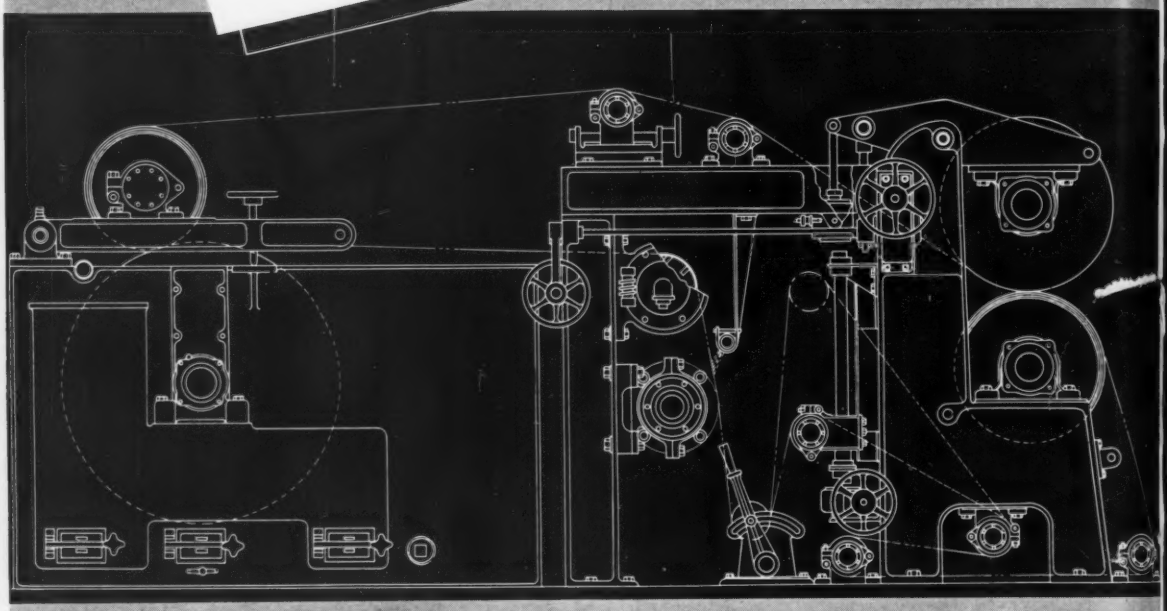
Modern Wet Machine

BUILT TO PAPER MACHINE QUALITY SPECIFICATIONS



This Downingtown Wet Machine is designed and built for low maintenance. It will pay for itself and return substantial dividends on the investment. Everything in its make-up is "the best". . . . Ends are of cast iron and the body is 3-inch Low Land Cypress.Whipper is balanced, all metal with four bats. Felt is continuously maintained in proper condition by a Downingtown Suction Felt Roll. The machine can be equipped with Pneumatic Loading and Lifting Equipment, if desired. . . . Naturally, this DeLuxe Downingtown Wet Machine costs a little more than the "ordinary," but we believe you'll agree that it's worth a lot more.

DOWNINGTOWN MANUFACTURING CO., DOWNINGTOWN, PA.

Write us for prints, specifications and a quotation. Deliveries are good.

DOWNINGTOWN

Designers & Builders Paper Making Machinery

ALLIS-CHALMERS

"Certified" Service

A BREAKDOWN on this 39-year-old Allis-Chalmers fan motor crippled operations at the plant of an important midwest electric utility. Immediate repair was vital. The Chief Engineer called the nearest Allis-Chalmers Certified Service shop. They picked up the rotor and returned it ready for service in less than twenty-four hours.

This is the kind of emergency cooperation you can expect from every Allis-Chalmers Certified Service shop. On everyday repairs and maintenance too, your Allis-Chalmers Certified Service shop will give you prompt service on Allis-Chalmers motors, pumps and transformers, using factory approved methods and parts. Every Allis-Chalmers Certified Service shop has been selected for skilled, personal, careful workmanship, adequate equipment and *service mindedness.*

HOW TO FIND NEAREST SERVICE SHOP

Allis-Chalmers Certified Service shops are located in major industrial centers throughout the country. New shops are being appointed continuously and most smaller centers will soon be covered. To find the shop nearest you, call your closest Allis-Chalmers District Office.

A 2543

MOTOR DELIVERIES GREATLY IMPROVED

Many types of Allis-Chalmers Motors are now in stock! Many other types are available on short delivery! For motors from 1 to 200 HP, check your nearest Allis-Chalmers Authorized Dealer. For motors larger than 200 HP, check with the nearest District Office. You may be able to get what you need sooner than you think.

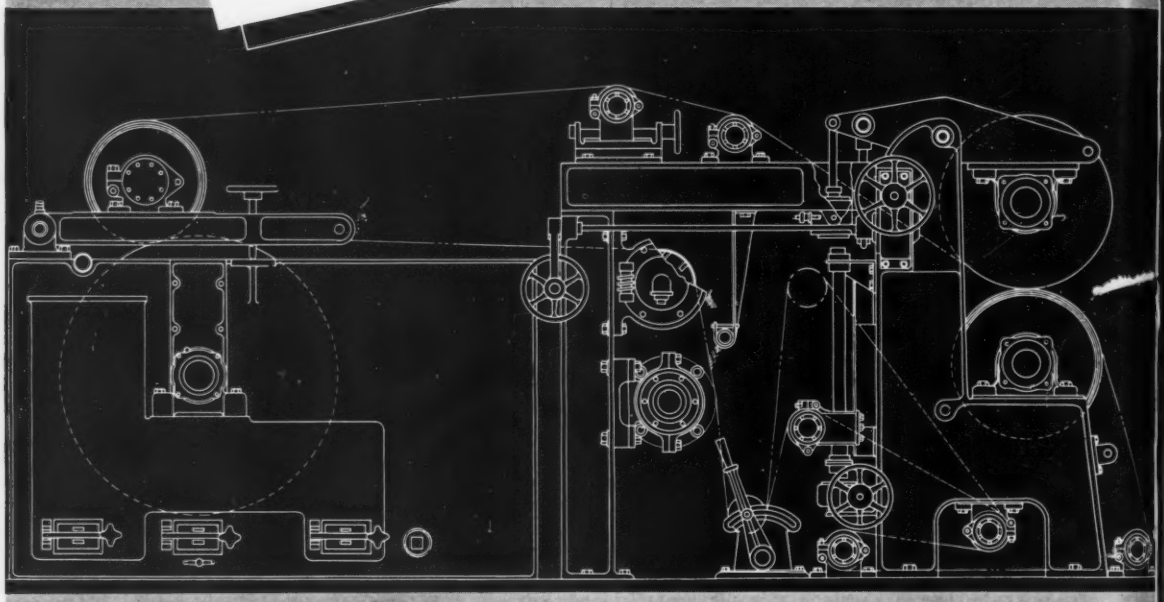
ALLIS-CHALMERS, 994A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Pioneers in Power and Electrical Equipment from Generation through Utilization

Modern Wet Machine

BUILT TO PAPER MACHINE QUALITY SPECIFICATIONS



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Pioneers in Power and Electrical Equipment from Generation through Utilization

Gear Down Maintenance Costs

Keep your enclosed gears fully protected with Texaco Meropa Lubricants.

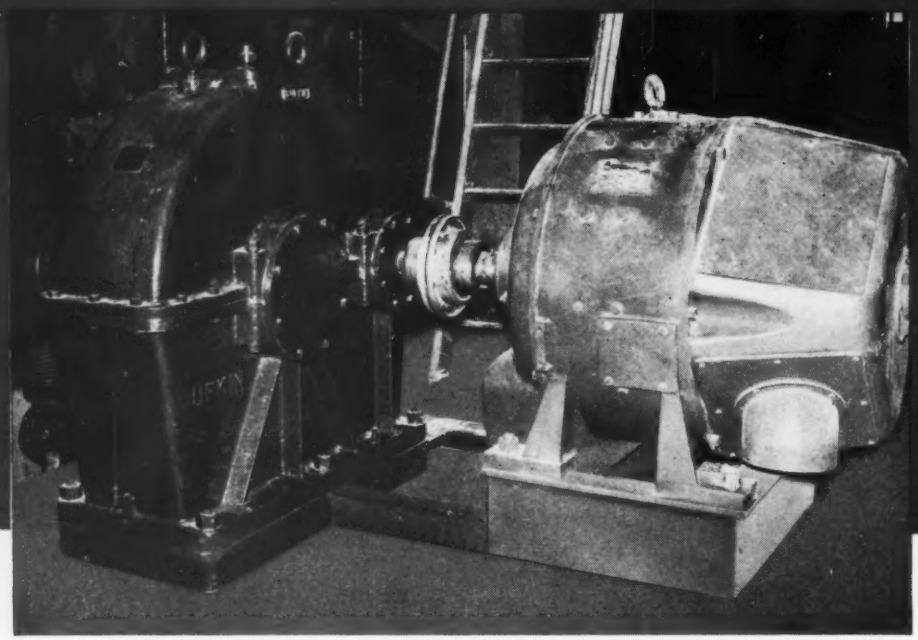

Photo courtesy of Lufkin Foundry & Machine Co.

PUT *Texaco Meropa Lubricants* in your reduction gear drives and you've got full protection for gears and bearings. These heavy-duty lubricants can shoulder the heaviest loads . . . and their tough films cling to the gear teeth for perfect follow-through. There's never a let-up in protection.

In addition, *Texaco Meropa Lubricants* keep fit for long service. They fight oxidation and thickening . . . do not foam . . . do not separate in service, storage, or centrifuging. They protect against bearing corrosion. Use *Texaco Meropa Lubricants* in all heavy-duty enclosed gears.

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★ ★ ★

Let a Texaco Lubrication Engineer help you with *all* your lubrication. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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REG. T. M.

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REPRESENTATIVES:

Eastern

BRUCE E. BROWN
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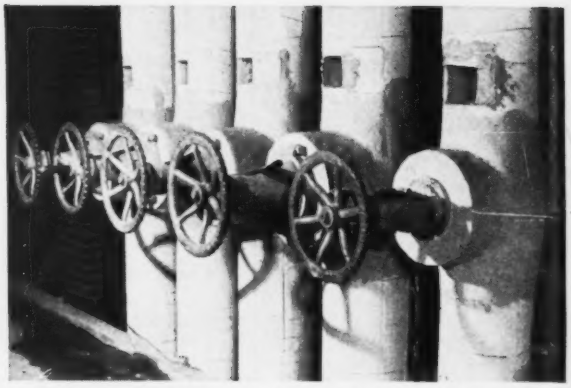
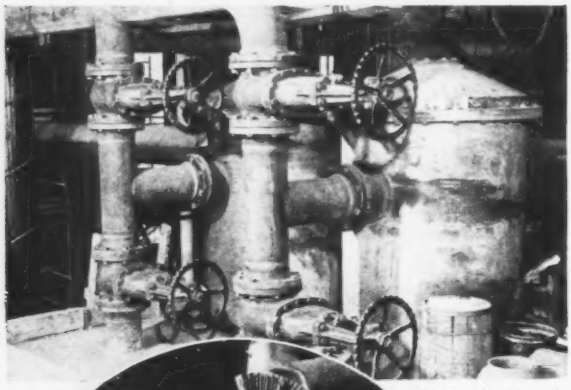
Walworth Iron Body Bronze Mounted Gate Valves (No. 726F) on steam line to paper machine.



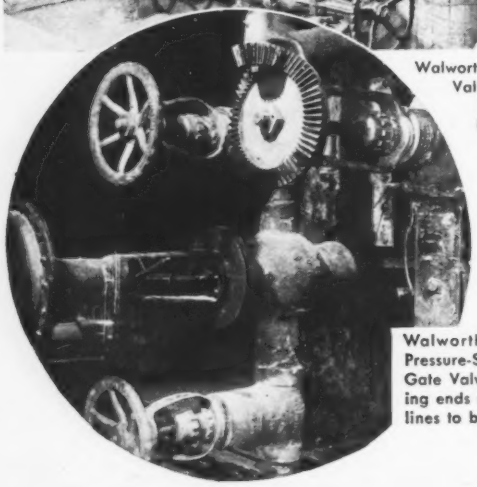
Walworth Series 900 Pressure-Seal Cast Steel Gate Valves with welding ends on main steam lines.

Walworth Special Alloy Pulp Mill Gate Valves (No. 725FS) and Check Valves (No. 928FS) on liquor lines.

Walworth Extra Heavy Steeliron Gate Valves (No. 786F) and Globe Valves (No. 955F) on pressure reducing lines.



Walworth All Iron Gate Valves (No. 727F) in weak black liquor service.



Walworth Series 900 Pressure-Seal Cast Steel Gate Valves with welding ends on feed water lines to boiler.

Valves for Pulp and Paper Mill Service

Valves play an important part in the efficient operation of any pulp or paper mill. For new construction, or for maintenance, pulp and paper mill engineers are choosing the right valve for each specific service from Walworth's complete line.

Walworth manufactures valves and pipe fittings of steel, steeliron, iron, bronze, and special alloys. Illustrated are Walworth valves of latest design, installed in a variety of services in a modern pulp and paper mill.

For further information and details of Walworth's complete line of valves and fittings, see your local Walworth distributor, or write for Catalog 47.

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Pulp and Paper Mill Division

60 EAST 42nd ST., NEW YORK 17, N. Y.

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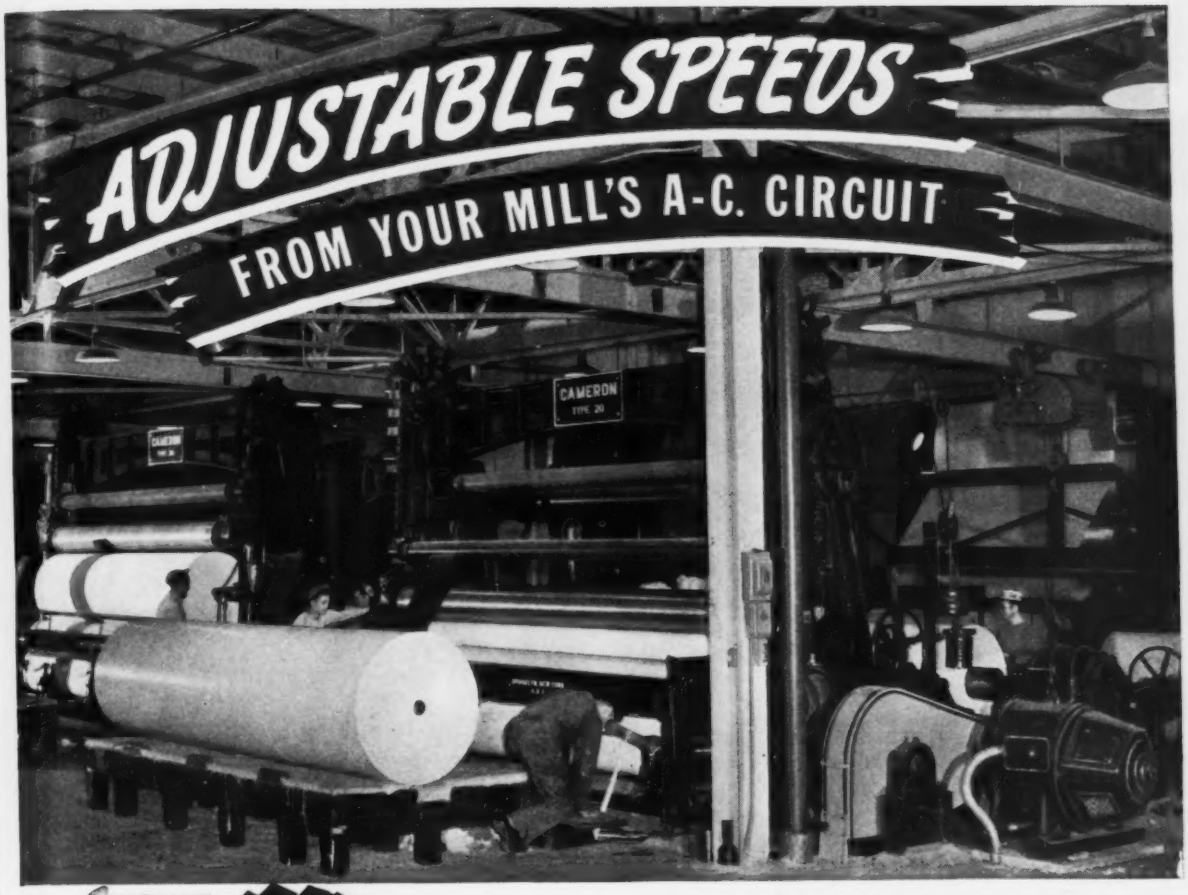
ADJUSTABLE SPEEDS FROM YOUR MILL'S A-C. CIRCUIT



The precise speed for maximum efficiency in every step in the operation of slitters and rewinders is provided electrically by Reliance V★S Drive.

Conveniently-packaged, factory-wired V★S Drives are available from 1 to 200 hp. Two or more motors may be operated simultaneously from a single Control Unit.

Reliance V★S Drive has demonstrated its ability to provide faster processing at lower cost on a wide variety of equipment throughout the pulp and paper industry. Built right into a machine or installed with it, this *All-electric, Adjustable-speed Drive* will operate direct from your mill's A-c. circuit. And all V★S functions, including stepless speed changing, quick, smooth starting and stopping and maintenance of proper tension, can be controlled at the machine or from any remote location—manually or automatically. For a better picture of the job Reliance V★S can do for you, write today for *new* Bulletin 311.

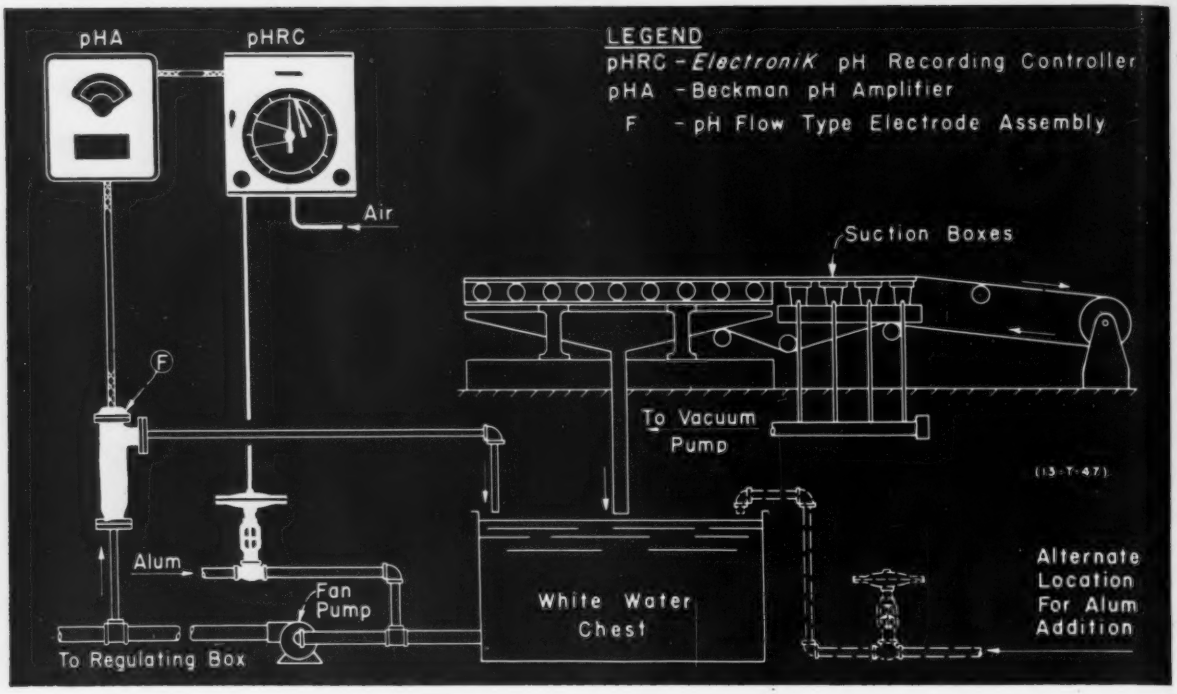
Sales Representatives in Principal Cities

RELIANCE ELECTRIC AND ENGINEERING CO.

1099 IVANHOE ROAD · CLEVELAND 10, OHIO

"Motor-Drive is More Than Power"

pH Control of Head Box Stock Essential to Even Sizing



ElectroniK Recording pH Controller

Maintenance of a constant pH of the head box stock is one requirement of quality paper making. If pH is too high, an insufficiently sized sheet results; if too low, sizing is uneven and alum is wasted.

Once adjusted, head box stock can be held at the correct pH value by automatic control of the white water make-up. The diagram illustrates a control system successfully employed in a number of mills. In this system an electrode electrically measures the acidity of the white water being fed to the head box. The current developed passes through the amplifier which is connected to the *ElectroniK* Recording Controller. The controller maintains the pH of the solution constant by making changes in the rate of alum addition.

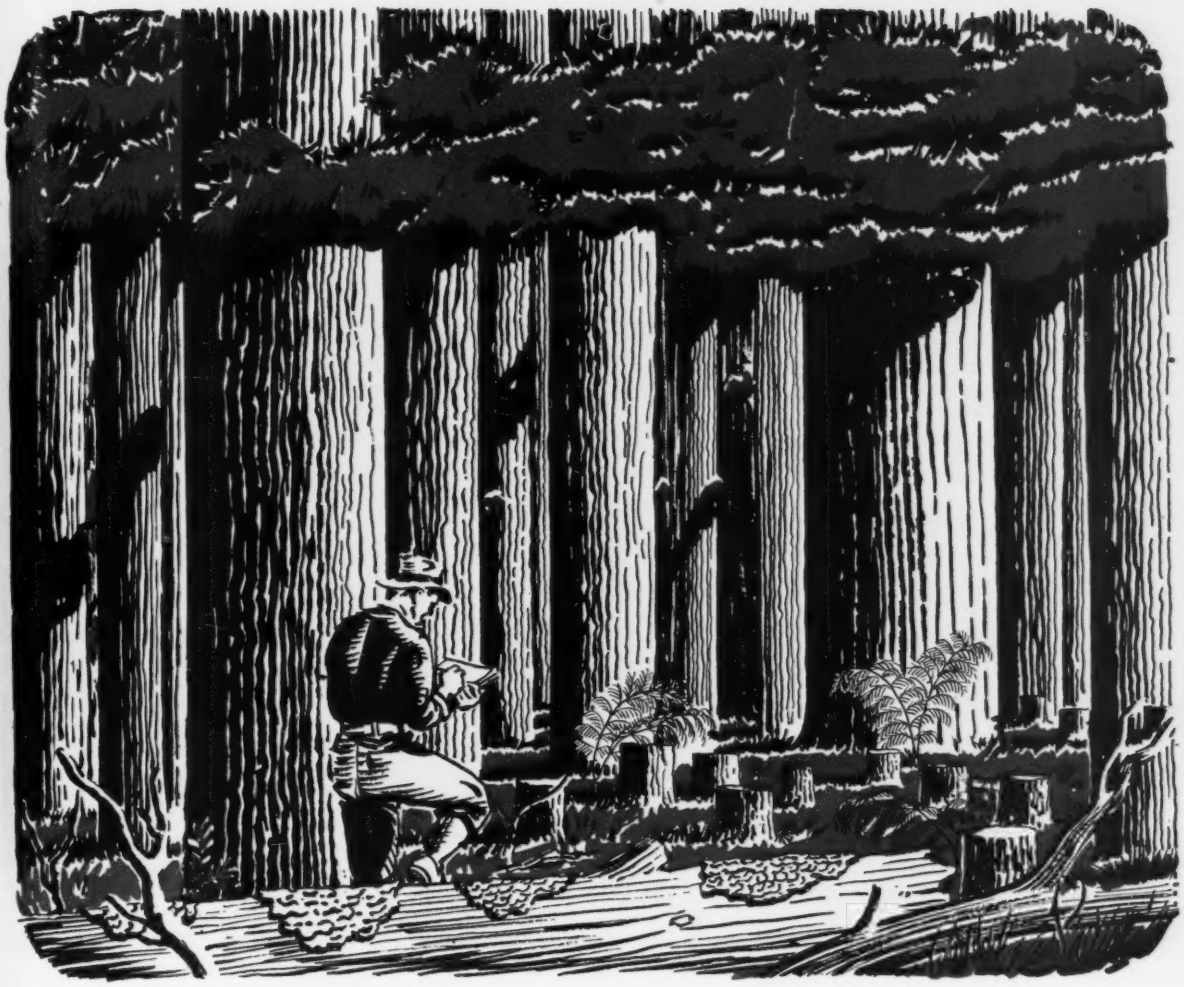
At many points in paper mill processes, pH control is aiding in minimizing waste, improving product quality and uniformity, reducing corrosion and increasing production rates. Because of their extensive experience in paper mill instrumentation, Brown engineers are qualified to analyze every control problem and to recommend the instruments and controls best suited to the individual mill. Call on them to help you—and write for the 80 page Bulletin 2801—"Instrumentation for the Paper Industry".

THE BROWN INSTRUMENT CO., 4510 WAYNE AVE., PHILADELPHIA 44, PA.
DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR CO.

Offices in principal cities of the United States, Canada and throughout the world.

BROWN *Advanced Instrumentation* **FOR BETTER PROCESSING**

Product of MINNEAPOLIS **Honeywell**



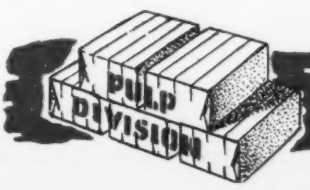
THIS IS PRE-LOGGING

Pre-logging is the harvesting in advance of smaller trees which otherwise would be damaged or destroyed if left until the big trees are logged. This isn't as simple as it sounds. To pre-log efficiently meant devising special new and mobile logging equipment.

However, the effort is justified in the recovery of many cords per acre of good clean material, highly desirable in the manufacture of sulphite or sulphate pulp.

Pre-logging fits into the method of "block" harvesting as used in the Douglas fir region, where forest lands are clearcut in a patchwork pattern, leaving blocks of seed trees as a source of regeneration. This is all part of the cycle of growth, harvest and regrowth known as Tree Farming.

Weyerhaeuser's use of the pre-logging method is another step toward more complete utilization of the timber crop.



WEYERHAEUSER

IF YOU WERE TO SAW A FARREL ROLL IN HALF...

. . . You would see why these rolls provide maximum paper-making service.

From the mirrorlike surface to a depth varying from 3/8" in small sizes to 2" in large diameter rolls, you would find a white iron "skin" or chill. This extremely hard face which is capable of taking a very smooth finish, is deep enough to assure long-wearing durability.

Below this relatively brittle chilled surface, you would see the gray iron structure of the body wherein lies the principal strength of the roll. The thickness of chill, intermediate mixed iron and gray iron body are combined in correct proportion to provide maximum service without danger of breakage.

To produce rolls from 5" to 72" in diameter and up to 312" in face length, requires specialized experience and facilities as Farrel has developed them over nearly a century of casting, machining and grinding tens of thousands of different sizes and types of rolls in the world's largest specialty roll shop.

Write for information about rolls for specific applications or for details of the other products listed on this page.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONN.

Plants: Ansonia, and Derby, Conn., Buffalo, N.Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Chicago, Los Angeles, Tulsa, Houston.

Farrel-Birmingham

FARREL PAPER MILL MACHINERY

ROLLS: Calender Stack Rolls
Board Calender Rolls
Super Calender Rolls
Glassine Calender Rolls
Friction Rolls
Breaker Rolls
Smoothing Rolls
Coating Rolls
Creping Rolls
Plater Rolls
Cutting Rolls
Paraffining and Waxing Rolls
Saturating Rolls
Silicating Rolls
Rolls for Miscellaneous Special Purposes
(Made of Chilled Iron, Gray Iron, Meehanite, Alloy Iron, Steel, Chromium-Plated)

CALENDERS: Paper and Board

GRINDING MACHINES: Roll

CALIPERS: Roll

GEARS, CUT: Spur, Single and Double Helical (Farrel-Sykes Continuous Tooth Type)

SPEED REDUCING GEAR UNITS

SPEED INCREASING GEAR UNITS

FLEXIBLE COUPLINGS.

1848 FARREL CENTENNIAL 1948

FB-460

Is High Yield *Fact* or *Fiction*?

Answer • • • It is a Fact, a definite accomplished fact with the Sutherland Process for the production of High Yield Kraft and Sulphite Pulps.

20% increase in yield is a fact, not fiction. So is improved quality resulting from pulp of higher strength. And think of the reduced cost per ton; also the economical utilization of our natural wood resources. Both of these processes are in operation. Write us.

SUTHERLAND REFINER CORPORATION

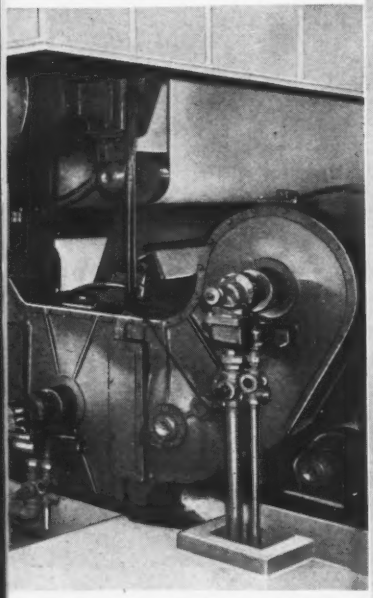
TRENTON, NEW JERSEY — *Manufactured in the United States by Valley Iron Works Co., Appleton, Wisconsin*

Sutherland Refiner Limited, Windsor Hotel, Montreal, P. Q.

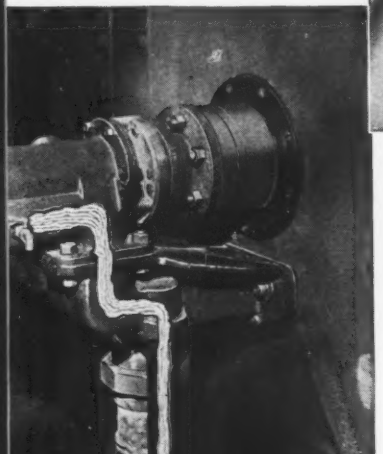
SUTHERLAND

PAPER · · · America's 6th Industry

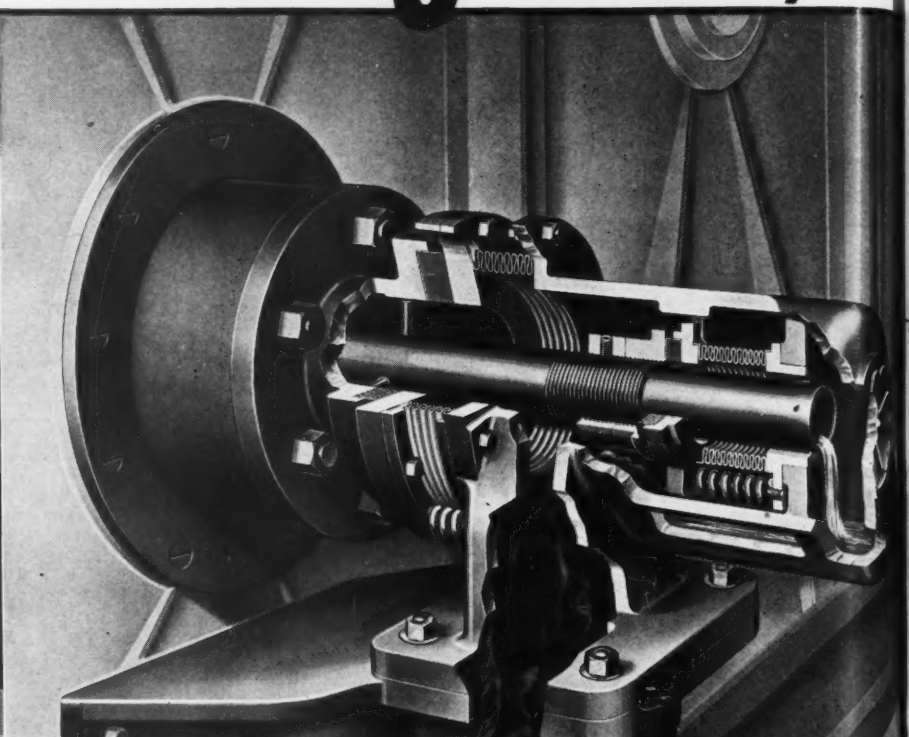
Cutaway view of Puseyjones Improved Steam Joint



Puseyjones Improved Steam Joint installed on Dry Part having enclosed type gearings. Can also be used on Dry Part with open type gearing by attaching bracket to special outside pipe structure.



Supporting bracket for Puseyjones Improved Steam Joint with vertical steam and water piping attached. See water passage within the bracket.



Now More than 2,000 Successful Installations

"So low in power consumption . . . so economical in maintenance . . . so easy to replace worn parts without shutdown . . . so trouble-free in operation . . ." These are just a few of the mill reports on the Puseyjones Improved Steam Joint. There are more than 2,000 now in use.

In the "Steam Joint Bulletin," we give full details on this remarkable new development, describing its application in connection with modern siphon type evacuators. Write for your copy today.

THE PUSEY AND JONES CORPORATION

Established 1848. Builders of Paper-Making Machinery

Wilmington 99, Delaware, U. S. A.

THE SIGN OF TRADE MARK SUPERIOR QUALITY

Paper TRADE JOURNAL
Reg. U.S. Pat. Off.

Dec. 16, 1948

VOL. 127, NO. 25

Rail Shipment Requirements Change Dec. 30

By EDWIN CHESTER HASTINGS
Edwin Chester Hastings Traffic Service, Pittsburgh, Pa.

The notation shippers of ground wood paper are required to place on bills-of-lading and shipping orders will be radically changed, effective December 31, 1948. On and after that date the notation must read as follows: *"Ground Wood Paper, other than napkin paper, newsprint, paper toweling, toilet paper, and unfinished blank wall paper, not coated, fiber content consisting of not less than 60 percent ground wood."* Failure to comply will bring higher freight charges. The requirement applies to rail shipments, carloads, with the point of origin in New York, Pennsylvania, New Jersey, Delaware, West Virginia and the upper part of Virginia north of Roanoke and Norfolk. Other states will follow and to save money, the shipper to be safe should put the above notation on the documents.

The term *ground wood papers* includes such paper as catalog, directory, drawing, manila, novel, poster, printing, tablet or writing, and does not include paper which has been further processed after its original manufacture. The rolls must be not less than 16 inches in diameter; or if in sheets, not less than 336 square inches in packages.

The low rate by rail on box material of Class 27½J (27½ percent of the first class rate) limited to fiberboard or pulpboard, with wooden cleats, shipped knocked-down, panels, applicable in the East and South, has been broadened to allow the flat sheets to be scored and slotted, with or without paper lining, printed or not printed, on carloads of 36,000 pounds minimum, the same rating, *but only applies in the East.*

Many containers are of such strength that they can be used for reshipments. Also, the purchaser sometimes repaints the product as a trade-mark to distinguish his peculiar brand and as a method of advertising. It is a requirement of Rule 41 in the Rail Classification for the "Certificate Of Maker" to be impressed on each carton. The standard form is 2" x 3¼" in size and is worded as shown in the accompanying illustration:

Certificate of Maker

This is a (type of container) made of fibreboard and conforms to all construction requirements of Consolidated Freight Classification.

Sidewall Test ..... lbs. per sq. in.

Net Weight Limit ..... Pounds

****(maker's name and address)****

Certificate of Shipper

This ..... bears manufacturers' certificate required by Rule 41 of Consolidated Freight Classification which has peen painted over.

****(shipper's name and address)****

When paper articles are shipped in cartons, it is also a requirement to insert on the bill-of-lading and shipping order that the container meets all the requirements. If that certificate on the carton is obscured in some way so that it can't be seen, the freight charges are increased on carloads ten percent and on less-than-carloads 20 percent. These increased charges also apply if the container does not meet the required specifications.

After December 30, 1948, the *Certificate of Maker* can be painted over and there will not be a penalty, provided a *Certificate of Shipper* is placed on the painted surface. (The "information" may be stenciled near the originai impression.) If this "Certificate of Maker" required by the Classification is painted over, the following information must replace it in size 1¼" x 3¼", as shown in the accompanying illustration:

(Continued on page 34)

Rayon Pulp Mill Planned for Natchez

NATCHEZ, Miss. — The International Paper Co. is ready to build a $20,000,000 rayon pulp mill here if a bond issue for $300,000 to provide for purchase of the site is approved by the people of this city on either January 11 or 18. The mill will have an annual payroll of $2,500,000 when in full operation.

Major Jack Friend, vice-president of the Southern Kraft Division of the International Paper Co., speaking before the Association of Commerce here on December 14, said that the proposed mill would consume about 270,000 cords of pulpwood annually. It will have an output of 300 tons of rayon pulp daily and will be the first in the world to use hardwoods instead of softwoods in the commercial production of dissolving pulps. The new process is based on the sulphate or kraft process instead of on the sulphite process used traditionally for making such pulps. From the viewpoint of the growing rayon industry in North America, this development means that dissolving woodpulp production will be sufficient to meet the increased demands from new rayon yarn capacity, existing and authorized.

Chairman Office Dropped

NEW YORK — *Following the meeting of directors on December 14, John H. Hinman, president of the International Paper Co., disclosed that the office of chairman of the corporation had been discontinued.*

This office has been vacant since the death of R. J. Cullen on November 13. It was created in 1943 when Mr. Hinman succeeded Mr. Cullen as president and Mr. Cullen became chairman.

Olmsted Gives Capehart Committee Industry Facts

NEW YORK — George Olmsted, Jr., president of the S. D. Warren Co., presenting a statement at a hearing of the Capehart (basing point) Committee on behalf of the United States pulp and paper industry, submitted among other statistics, the results of a survey of sales of 18 representative paper and pulp mills, as shown in the accompanying tabulation.

Pointing out that paper making is a "continuous operation," Mr. Olmsted stated in part:

"The primary industry, engaged in making paper and pulp, employed over four billion dollars of assets in 1947. In addition to this primary industry there are several large industries engaged in converting the products of our industry into useful products for consumption. The financial data on these converters are not readily available but we need only to mention such items as paper bags, rayon, envelopes, shipping containers, drinking cups, milk containers, and the whole gamut of printing and publishing to indicate that there is a tremendous financial investment dependent upon the proper functioning of the primary paper and pulp industry.

"In our industry we need $20,700 of total assets to keep a production worker employed. This is the highest investment per worker for any large industry. It indicates the high concentration of capital required in the paper and pulp mills of this country.

"Some 96 tons was the average daily capacity of the average paper mill in 1947. The investment in this 'average paper mill' was $5,380,000. Large paper mills make over 1,000 tons a day and there are many units of over 500 tons daily capacity. By contrast with these big fellows there are a large number of five-, six- and seven-ton mills, making a large variety of papers, but the overall average capacity is 95 tons daily.

(Continued on page 15)

Building Watson Island Cellulose Plant

PRINCE RUPERT, B. C.—Building will commence early in the new year at the new plant of the Columbia Cellulose Co. Preliminary work is practically completed. Total value of the project at Watson Island, nine miles from Prince Rupert, is between $25,000,000 and $35,000,000.

Contracts for construction of the permanent buildings have not yet been let, but workmen are busy erecting temporary quarters for building crews and several carloads of structural steel have arrived.

When contracts are let, at least a dozen projects will be under way simultaneously, including buildings, machinery installation, log hauling and driving of a 14,000-foot water tunnel from Prudhomme Lake, six miles away.

H. D. Reid will superintend coastal logging for the company, set up camps and make arrangements to buy logs from district private operators. Next year, it is expected that ten million feet of logs will be produced with production increasing in 1950.

Coastal logging operations will be separate from those on the upper Skeena. Logs produced in the Terrace area will be driven down the river in full volume by 1950. The river operations will make necessary channel improvements and control of run-off.

Charles Klotz, of Celanese Corp. of America, who will be project engineer, is expected to arrive from New York to take up residence at Prince Rupert about the first of January.

Planned Reforestation

CHARLESTON, S. C.—According to Manager R. E. Haynes, a planned program of reforestation and planting of pine trees is being put in practice by the West Virginia Pulp & Paper Co.'s Southern Woodlands division. Mr. Haynes said the plan is intended to achieve maximum pine production on the company's acreage.

"A total of 2,725 acres will be planted in loblolly, slash, or spruce pine this year in the Charleston district of the division," he continued. "This district includes Charleston, Dorchester, Berkeley and Colleton counties. The company also has lands in Orangeburg, Camden, Kershaw, Williamsburg, Horry and Georgetown counties.

"The company will plant 1,639,000 pines on the acreage to be planted. The seedlings, purchased from the South Carolina state forestry commission, will be set out approximately 600 to the acre. Of the total to be planted, some 285 acres are fields, some of which have been in cultivation."

Credit Executives Appraise 1949

NEW YORK—How do credit executives view business conditions in the year ahead? Opinions on this question are reported by Henry H. Heimann, executive manager of the National Ass'n., of Credit Men, in his *Monthly Business Review* released December 15. These opinions were given at the annual meeting of the national officers, board of directors and committee chairmen at the annual NACM meeting and reflect the views of the nearly 30,000 credit and financial executives in the larger markets of the country. A general summary of these opinions as presented by Mr. Heimann follows:

Payments on accounts are slowing up. However, they all agreed that the payments were not slower at present than they were before the war. Two-thirds of the companies represented by the credit managers have not changed their terms of payment in the last six years. One-third has made a change by shortening terms.

Two-thirds of the group reported they had not changed the cash discounts offered for prompt payment in the last six years. One-third reported they had changed their cash discounts by reducing the rate. None reported they had increased their cash discounts.

Two-thirds reported that their accounts receivable at present are at the peak of their post-war business. However, three-fourths of the group reported that 'when they took into consideration the increased volume of their sales, their accounts receivable were not higher relatively than they were before the war.

The entire group anticipated higher bad debt losses in the year ahead, but they did not think these bad debt losses, when compared to the increased sales, would be out of hand, or a serious threat to earnings.

Two-thirds of the group said their inventories were higher than usual. One-half of those present said they were going to concentrate on reducing inventories in their business.

Over 80 percent reported that their companies were not planning any new plant expansion in the next two years.

Four-fifths of the group said they were not planning to purchase unusual amounts of new equipment, in the year ahead.

Three-fourths said their companies had increased their sales force and fifty percent indicated increases in the personnel of their credit departments. Two-thirds indicated their companies now have a pension plan in effect for their employees.

Labor shortages were anticipated in 1949 by three-fourths of the group while five-sixths anticipated additional wage demands in the coming year. Two-thirds of the group reported that "white collar workers" were given salary adjustments whenever they were given to factory workers. Only three-fifths of the group reported that their plants were unionized.

One-half of the credit men stated they expected the earnings of their business to decrease in the year ahead. One-fourth of them expected their earnings to remain at present level. Another one-fourth expected their earnings would increase.

There was a practically unanimous opinion that the break-even point in industrial operations is now much higher than before the war and that this phase of management was being given intense study by all companies whether large or small.

Only one-third of the group expected more foreign business in the year ahead.

As to rearmament as a business source, one-half said they were not interested. One-fourth reported they had obtained some rearmament orders, while one-fourth indicated they would attempt to secure some of this business.

Olmsted Gives Facts

(Continued from page 15)

A Mass-Production Industry

"All paper mills, because of the continuous nature of the process and the high capital investment, must run 24 hours a day while operating. Even the small mills making specialties are mass production mills compared with the customary eight-hour-day manufacturing operation. All paper mills operate on a "shift" basis usually three eight-hour shifts daily.

Survey of Sales of 18 Representative Paper and Pulp Mills

Sales	Percent Shipped to Freightwise Favorable Area*
$7,927,336	.0
9,437,000	.43
19,638,269	2.5
5,774,408	5.6
78,000,000	6.0
29,200,000	15.6
600,000	25.0
471,328	26.3
299,243	30.3
10,725,700	31.1
3,000,000	31.2
6,853,449	45.0
1,416,835	49.2
504,003	53.1
4,471,229	55.1
3,967,000	65.3
24,683,468	66.7
10,926,300	80.0
Total $217,895,568	32.7 Average

* Freightwise favorable area is defined as that area where a mill is at no freight rate disadvantage as compared with its nearest competitors.

"The paper industry is a continuous process mass production industry which must operate at high volume, (i.e. 24 hours a day) to achieve low costs.

"In order to maintain this high volume nationwide diversified markets are necessary. Because of the diversity of climate and industry the pattern of business activity changes at different times in different parts of the United States. Consequently in order to maintain steady mass consumption of its product a paper mill must be able to sell competitively all over the United States.

Effect of Continuous Process and Large Capital Investment

"The large capital investment and the continuous process employed by the paper industry require steady continuous production if a low cost and a normal profit are to be maintained. A drop of 15 percent in the ratio of production to capacity means a drop of over 50 percent in return on net worth in this industry. Thus it is of vital importance both to the company and its employes and to its dependent community that a high level production be maintained. This can only be the result of mass consumption at low unit cost."

Philadelphians Elect Officers —Play Santa to Children

PHILADELPHIA—Edwin V. Rementer of the Hooper Paper & Twine Co., was elected president of the Philadelphia Paper & Cordage Assn., at the organization's annual meeting and election in Gimbel's Colonial Room restaurant on December 2. Others elected were Edwin A. Dages of E. A. Dages, vice-president; Harold T. Robinson of the Whiting-Patterson Co., secretary; Alfred N. Eccleston of Galer & Hults, treasurer; Frank J. Bushemi of the Garrett-Buchanan Co., retiring president of the PP & CA, and Walter L. Benson of the Dennison Mfg. Co., directors.

A feature of the occasion was a Christmas Party for ten young victims of polio. The boys and girls received gifts and candy distributed by Santa Claus himself (Charles J. Stokes of the Sabin-Robbins Paper Co.) after a big turkey dinner.

This event is apart from the 18th annual Christmas Party of the Philadelphia Paper & Cordage Assn., scheduled for December 15, given for underprivileged children, selected by the Salvation Army. Plans for that event were under the direction of Edwin V. Rementer.

PPTA Dinner Jan. 12

Frederic S. Balch, president of the Paper Trade Assn. of Philadelphia and president of the Schuylkill Paper Co., reports the appointment of a Special Dinner Committee for the 5th Annual Dinner & Reception, commemorating the 45th Anniversary of the Paper Trade Assn. of Philadelphia at the Warwick Hotel, January 12. Committee members are as follows: Henry L. Adler, President Huff Paper Co., (chairman); W. Brolsford Killhour, president, Quaker City Paper Co.; Ralph G. Luff, president of D. L. Ward Co. and president of the NPTA; Allen M. Russell, president, Molten Paper Co.; and Harold Isen, president, Enterprise Paper Co.

The dinner will be attended by members of the local association, their friends, and invited guests who are executives from the paper manufacturers from all over the country.

(Continued on page 34)

Santa Claus (Charles J. Stokes of the Sabin-Robbins Paper Co.) with two of his little guests.

Frank J. Bushemi, retiring president, (right, center) relinquishes gavel to Edwin V. Rementer, new president of the Philadelphia Paper & Cordage Ass'n. . . . Other new officers looking on are: (left) Harold T. Robinson, secretary; (center) Alfred N. Eccleston, treasurer; (right) Edwin A. Dages, vice-president.

Bids Opened on GPO First-Quarter, 1949, Paper Needs

WASHINGTON — Bids were received by the Joint Congressional Committee on Printing for paper for the use of the Government Printing Office for a three months' period beginning January 1, 1949. Awards, announced December 13, are indicated by asterisks (*) before the names of the successful bidders in the tabulation herewith.

Newsprint

No. 1—850,000 lbs., 24x36—64; rolls, 19, 24, 36, and 48 ins. wide, 36 inches in diameter (3-inch fiber cores).

Walker Goulard Plehn Co.	.0849c
Paper Corp. of U. S.	.0862c
Monodon Corp.	.0845c
All bids rejected.	

Machine-Finish Book

No. 3—40,000 lbs., 25x38—70; flat, cut any size, min. 21 ins., max. 48 ins.

Walker Goulard Plehn Co.	.1094c
Paper Corp. of U. S.	.1109c
* Mead Sales Co.	.104c
Butler Co.	.11158c
Barton, Duer & Koch Paper Co.	.1161c

No. 4—600,000 lbs., 25x38—70; flat, cut 24x38, 28x38, and 38x48 ins.

Walker Goulard Plehn Co.	.1094c
Mudge Paper Co.	.1223c
Paper Corp. of U. S.	.1109c
* Mead Sales Co.	.104c
Butler Co.	.11158c
Barton, Duer & Koch Paper Co.	.1161c
Frank Parsons Paper Co.	.1111c

No. 7—200,000 lbs., 25x38—70; rolls, 19 and 38 ins. wide, 36 ins. in diameter (3-inch fiber cores).

Walker Goulard Plehn Co.	.09879c
Birmingham & Prosser Co.	.0972c
Mudge Paper Co.	.1138c
Paper Corp. of U. S.	.0984c
* Mead Sales Co.	.0965c
Butler Co.	.09914c
Barton, Duer & Koch Paper Co.	.1075c

No. 9—200,000 lbs., 25x38—70; rolls, 24, 36, and 48 ins. wide, 36 inches in diameter (3-inch fiber cores).

Walker Goulard Plehn Co.	.09879c
Birmingham & Prosser Co.	.0972c
* Mead Sales Co.	.0965c
Mudge Paper Co.	.1138c
Paper Corp. of U. S.	.0984c
Butler Co.	.09914c
Barton, Duer & Koch Paper Co.	.1075c

Offset Book

No. 18—200,000 lbs., 25x38—80; flat, cut any size, min. width 24 ins., max. width 48 ins.; the grain to run lengthwise of the sheet.

Birmingham & Prosser Co.	.121c
Mudge Paper Co.	.1368c
* Paper Corp. of U. S.	.1149c
The Pulp & Paper Trading Co.	.119c
Central Ohio Paper Co.	.1176c
Butler Co.	.1234c
R. P. Andrews Paper Co.	.1249c
Frank Parsons Paper Co.	.1174c

No. 19—500,000 lbs., 25x38—100; flat, cut any size, min. width, 24 ins., max. width 48 ins., the grain to run lengthwise of the sheet.

Stanford Paper Co.	.11c
Walker Goulard Plehn Co.	.1112c
* Birmingham & Prosser Co.	.103c
Mudge Paper Co.	.12c
Paper Corp. of U. S.	.1097c
Whitaker Paper Co.	.1119c
Pulp & Paper Trading Co.	.114c
Central Ohio Paper Co.	.1112c
Butler Co.	.1134c
R. P. Andrews Paper Co.	.1199c
Frank Parsons Paper Co.	.1083c

Offset Poster

No. 20—160,000 lbs., 25x38—120; flat, cut any size, min. width 24 ins., max. width 48 ins., the grain to run lengthwise of the sheet.

Stanford Paper Co.	.11c
Walker Goulard Plehn Co.	.109c
Mudge Paper Co.	.1117c
Paper Corp. of U. S.	.1064c
Pulp & Paper Trading Co.	.114c
Central Ohio Paper Co.	.1095c
Butler Co.	.11118c
R. P. Andrews Paper Co.	.1114c
* Frank Parsons Paper Co.	.1038c

Antique Book

No. 21—40,000 lbs., 25x38—90; flat, cut 32x42, 33x43, and 38x50 ins.

Walker Goulard Plehn Co.	.125c
Paper Corp. of U. S.	.107c
Mead Sales Co.	.1064c
Pulp & Paper Trading Co.	.119c
* R. P. Andrews Paper Co.	.0921c
Barton, Duer & Koch Paper Co.	.1035c
Wilcox Walter Furlond Paper Co.	.1085c

No. 22—80,000 lbs., 25x38—120; flat, cut 32x42, 33x43, and 38x50 ins.

Walker Goulard Plehn Co.	.113c
Paper Corp. of U. S.	.104c
Mead Sales Co.	.1064c
Pulp & Paper Trading Co.	.119c
R. P. Andrews Paper Co.	.0921c
Wilcox Walter Furlong Paper Co.	.1046c
Barton, Duer & Koch Paper Co.	.1035c
* Frank Parsons Paper Co.	.0921c

50% Laid Antique Book

No. 29—20,000 lbs., 25x38—140; flat, cut 38x48 ins.; the laid marks to run the 38-inch direction of the sheet; the grain and chain marks to run lengthwise of the sheet.

* Howard Paper Mills, Inc. (Aetna Div.)	.1509c
Stanford Paper Co.	.17c
Walker Goulard Plehn Co.	.1699c
Paper Corp. of U. S.	.179c
Pulp & Paper Trading Co.	.1898c
Cauthorne Paper Co.	.176c
Barton, Duer & Koch Paper Co.	.1549c

Water Resistant (Text) Book

No. 30—40,000 lbs., 25x38—120; flat, cut 32x42 and 35x45 ins.

Stanford Paper Co.	.155c
* Paper Corp. of U. S.	.1355c
Pulp & Paper Trading Co.	.157c
Barton, Duer & Koch Paper Co.	.167c

Supercalendered Book

No. 33—150,000 lbs., 25x38—90; flat, cut any size, min. width 24 ins., max. width 48 ins.

Walker Goulard Plehn Co.	.1129c
Mudge Paper Co.	.1196c
Mead Sales Co.	.1148c
Butler Co.	.11515c
* R. P. Andrews Paper Co.	.1022c

No. 34—200,000 lbs., 25x38—90; rolls, 28½ and 38 ins. wide, 36 ins. in diameter (3-inch fiber cores).

Mead Sales Co.	.1074c
* R. P. Andrews Paper Co.	.0896c

Coated Book

No. 35—400,000 lbs., 25x38—100; flat, cut any size, min. width 24 ins., max. width 48 ins.

Barton, Duer & Koch Paper Co.	.1156c
* Frank Parsons Paper Co.	.1051c

No. 36—50,000 lbs., 25x38—120; flat, cut any size, min. width 24 ins., max. width 48 ins.

Barton, Duer & Koch Paper Co.	.1156c
* Frank Parsons Paper Co.	.1051c

Litho Coated Book

No. 40—25,000 lbs., 25x38—100; flat, cut 32x42 and 38x48 ins.; the grain to run lengthwise of the sheet.

* Stanford Paper Co.	.1615c
Birmingham & Prosser Co.	.1794c

No. 41—25,000 lbs., 25x38—120; flat, cut 32x42 and 38x48 ins.; the grain to run lengthwise of the sheet.

* Stanford Paper Co.	.14c
Birmingham & Prosser Co.	.1587c

Chemical Wood Mimeograph, White and Colored

No. 44—2,000,000 lbs., white, No. 40. Flat, cut 28½x34½, 32½x42½, 38x48½ ins. Grain: Size 28½x34½ ins., to run the 28½ inch way; size 32½x42½ to run the 42½ inch way; size 38x48½ ins., to run the 38 inch way.

Stanford Paper Co.	.0999c
Walker Goulard Plehn Co.	.1115c
* Birmingham & Prosser Co.	.0937c
Paper Corp. of U. S. (250,000 lbs. only.)	.1045c
Paper Corp. of U. S. (1,000,000 lbs. only.)	.111c
Whitaker Paper Co.	.1009c
Mead Sales Co. (400,000 lbs. only.)	.1221c
Pulp & Paper Trading Co. (600,000 lbs. only.)	.114c
Graham Paper Co. (294,000 lbs. only.)	.1195c
R. P. Andrews Paper Co.	.0995c
Barton, Duer & Koch Paper Co.	.1063c
Wilcox Walter Furlong Paper Co. (1,200,000 lbs. only.)	.10094c
Frank Parsons Paper Co.	.1011c

No. 45—50,000 lbs., blue, buff, green, pink, and yellow, No. 40. Flat, cut 32½x42½, and 38x48½ ins. Grain: Size 32½x42½ to run the 42½ inch way; size 38x48½ ins. to run the 38 inch way. Min. order, one color, 10,000 lbs.

Walker Goulard Plehn Co.	.1165c
* Birmingham & Prosser Co.	.1012c
Paper Corp. of U. S.	.12c
Pulp & Paper Trading Co.	.118c
Wilcox Walter Furlong Paper Co.	.144c

25% Mimeograph

No. 46—100,000 lbs., No. 40; Flat, cut 28½x34½, 32½x42½, 34½x44, 38x48½, and 40½x42½ ins. Grain: Size 28½x34½ ins. to run the 28½ inch way; sizes 32½x42½ and 40½x42½ ins. to run the 42½ inch way; size 38x48½ ins. to run the 38 inch way.

* Howard Paper Mills (Aetna Div.)	.1154c
Stanford Paper Co.	.1339c
Walker Goulard Plehn Co.	.1213c
Paper Corp. of U. S.	.124c
Pulp & Paper Trading Co.	.1398c
Old Dominion Paper Co.	.1267c
R. P. Andrews Paper Co.	.1249c

Duplicator Copy Paper, Liquid Process, White and Colored

No. 47—100,000 lbs., white, No. 40. Flat, cut 32x42 and 34x44 ins.; the grain to run lengthwise of the sheet.

Stanford Paper Co.	.128c
Walker Goulard Plehn Co.	.1346c
Eastern Corp.	.1338c
* Paper Corp. of U. S.	.1164c
Whitaker Paper Co.	.1324c
Pulp & Paper Trading Co.	.1322c

No. 48—50,000 lbs., pink, yellow, green, and blue, No. 40; flat, cut 32x42, 34x44, and 40x52½ ins.; the grain to run lengthwise of the sheet.

* Stanford Paper Co.	.1354c
Walker Goulard Plehn Co.	.1398c
Pulp & Paper Trading Co.	.1374c
Wilcox Walter Furlong Paper Co.	.144c

Blue USMO Safety Writing

No. 49—250,000 lbs., No. 32. Rolls, 22 ins. wide, 24 ins. in diameter (3-inch fiber cores).

Walker Goulard Plehn Co. (50,000 lbs. only.)	.1944c
Walker Goulard Plehn Co. (50,000 lbs. only.)	.1974c
Walker Goulard Plehn Co. (50,000 lbs. only.)	.1994c
* R. P. Andrews Paper Co.	.1916c
* D. L. Ward Co. (100,000 lbs. only.)	.1914c

Chemical Wood Writing, White and Colored

No. 52—500,000 lbs., white, No. 32; flat, cut any size, min. width 21 ins., max. width 48 ins.

* Walker Goulard Plehn Co.	.1074c
Paper Corp. of U. S.	.11c
Whitaker Paper Co.	.1103c
Mead Sales Co.	.128c
Pulp & Paper Trading Co.	.1175c
Cauthorne Paper Co.	.1149c
R. P. Andrews Paper Co.	.1083c
Barton, Duer & Koch Paper Co.	.1077c

No. 53—600,000 lbs., white, No. 40; flat, cut any size, min. width 21 ins., max. width 48 ins.

Walker Goulard Plehn Co.	.1074c
Paper Corp. of U. S.	.1075c
Whitaker Paper Co.	.1043c
Mead Sales Co.	.1231c
Pulp & Paper Trading Co.	.1115c
Central Ohio Paper Co.	.1039c
* R. P. Andrews Paper Co.	.1024c
Barton, Duer & Koch Paper Co.	.1245c

No. 54—160,000 lbs., white, No. 32. Rolls, min. width 16 ins., 36 ins. in diameter, max. width 48 ins. (3-inch fiber cores).

Walker Goulard Plehn Co.	.09879c
* Paper Corp. of U. S.	.09c
Whitaker Paper Co.	.0979c
Mead Sales Co.	.1177c
Pulp & Paper Trading Co.	.1097c
R. P. Andrews Paper Co.	.0936c
Barton, Duer & Koch Paper Co.	.12c

No. 55—250,000 lbs., white, No. 40; rolls, min. width 16 ins., 36 ins. in diameter, max. width 48 ins. (3-inch fiber cores).

Walker Goulard Plehn Co.	.09879c
Paper Corp. of U. S.	.09c
Whitaker Paper Co.	.0929c
Mead Sales Co.	.1118c
Pulp & Paper Trading Co.	.1097c
* R. P. Andrews Paper Co.	.0877♦
Barton, Duer & Koch Paper Co.	.114c

No. 56—40,000 lbs., blue, buff, green, pink, salmon, and yellow, No. 26. Flat, cut any size, min. width 21 ins., max. width 48 ins.

* Walker Goulard Plehn Co.	.1379c
Paper Corp. of U. S.	.1395c
Pulp & Paper Trading Co.	.1396c

No. 57—250,000 lbs., blue, buff, cherry, green, pink, salmon, and yellow; No. 32; flat, cut any size, min. width, 21 ins., max. width 48 ins. Minimum order, one color, 10,000 lbs.

* Walker Goulard Plehn Co.	.1174c
Paper Corp. of U. S.	.1175c
Pulp & Paper Trading Co.	.122c
Butler Co.	.1225c

No. 58—180,000 lbs., blue, buff, cherry, green, pink, salmon and yellow, No. 40; flat, cut any size, min. width 21 ins., max. width 48 ins. Min. order, one color, 10,000 lbs.

Walker Goulard Plehn Co.	.1174c
* Paper Corp. of U. S.	.115c
Pulp & Paper Trading Co.	.122c
Butler Co.	.1215c

No. 59—50,000 lbs., blue, buff, green, pink, salmon and yellow, No. 32. Rolls, 38 inch, 36 ins. in diameter (3-inch fiber cores).

Walker Goulard Plehn Co.	.1199c
* Paper Corp. of U. S.	.105c
Pulp & Paper Trading Co.	.1165c

No. 60—50,000 lbs., white, No. 24. Rolls, 22 inch, 34 to 36 ins. in diameter (3-inch fiber cores).

Walker Goulard Plehn Co.	.117c
* Paper Corp. of U. S.	.1166c
Mead Sales Co.	.1239c
Pulp & Paper Trading Co.	.1396c
Butler Co.	.135c

No. 62—50,000 lbs., blue, green, pink yellow, buff, cherry and salmon. No. 24. Rolls, 22 inch, 34 to 36 inches in diameter (3-inch fiber cores).

Walker Goulard Plehn Co.	.1299c
* Paper Corp. of U. S.	.1245c
Pulp & Paper Trading Co.	.1441c
Butler Co.	.1425c

25% Lithograph-Finish Map

No. 69—40,000 lbs., No. 40. Flat, cut any size, min. width 22 ins., max. width 48 ins.; the grain to run lengthwise of the sheet.

* Howard Paper Mills (Aetna Div.)	.1468c
Stanford Paper Co.	.1495c
Walker Goulard Plehn Co.	.1547c
Franklin Research Co.	.1819c
Paper Corp. of U. S.	.179c
Pulp & Paper Trading Co.	.1503c
Barton, Duer & Koch Paper Co.	.1495c

50% Lithograph-Finish Map

No. 70—10,000 lbs., No. 32. Flat, cut any size, min. width 22 ins., max. width 48 ins.; the grain to run lengthwise of the sheet.

* Howard Paper Mills (Aetna Div.)	.1586c
Stanford Paper Co.	.1641c
Franklin Research Co.	.2035c
Paper Corp. of U. S.	.1944c
Pulp & Paper Trading Co.	.1732c
Barton, Duer & Koch Paper Co.	.1595c
Frank Parsons Paper Co.	.1735c

No. 72—180,000 lbs., No. 48. Flat, cut any size, min. width 22 ins., max. width 48 ins., the grain to run lengthwise of the sheet.

Howard Paper Mills(Aetna Div.)	.1539c
* Stanford Paper Co.	.1527c
Walker Goulard Plehn Co.	.1589c
Franklin Research Co.	.2035c
Paper Corp. of U. S.	.1861c
Pulp & Paper Trading Co.	.1589c
Cauthorne Paper Co.	.2014c
R. P. Andrews Paper Co.	.191c
Barton, Duer & Koch Paper Co.	.1562c
* John W. MacNeil, Inc. (90,000 lbs. only.)	.1516c
John W. MacNeil, Inc. (90,000 lbs. only.)	.1541c

High Wet Strength Map

No. 78—200,000 lbs., No. 48; flat, cut any size, min. width 22 ins., max. width 48 ins.; the grain to run lengthwise of the sheet.

Howard Paper Mills (Aetna Div.)	.1646c
Stanford Paper Co.	.16c
* Walker Goulard Plehn Co.	.1525c
Paper Corp. of U. S.	.1625c
Pulp & Paper Trading Co.	.1692c
Cauthorne Paper Co.	.1579c
Barton, Duer & Koch Paper Co.	.1574c
John W. MacNeil, Inc.	.1685c

50% White Chart, Lithograph-Finish

No. 79—60,000 lbs., No. 72; flat, cut any size, min. width 22 ins., max. width 46 ins.; the grain to run lengthwise of the sheet unless otherwise specified.

Stanford Paper Co.	.1787c
Walker Goulard Plehn Co.	.1899c
Franklin Research Co.	.2131c
Pulp & Paper Trading Co.	.1888c
Cauthorne Paper Co.	.1968c
R. P. Andrews Paper Co.	.2156c
* Barton, Duer & Koch Paper Co.	.174c

100% White Chart, Lithograph-Finish

No. 82—10,000 lbs., No. 96. Flat, cut any size, min. width 22 ins., max. width 46 ins.; the grain to run lengthwise of the sheet unless otherwise specified.

R. P. Andrews Paper Co.	.3482c
* Barton, Duer & Koch Paper Co.	.26c

Chemical Wood Manifold, White and Colored

No. 83—20,000 lbs., white, No. 18; flat, cut 21x32, 28x34, 32x42, and 34x44 ins.

* Walker Goulard Plehn Co.	.1522c
Paper Corp. of U. S.	.16c
Old Dominion Paper Co.	.14438c
Butler Co.	.1923c
Frank Parsons Paper Co.	.1598c

No. 85—30,000 lbs., blue, buff, cherry, green, pink, salmon, and yellow, No. 18. Flat, cut 28x34, 32x42, and 34x44 ins. Min. order, one color, 10,000 lbs.

* Walker Goulard Plehn Co.	.1699c
Paper Corp. of U. S.	.17c
Old Dominion Paper Co.	.15568c
Butler Co.	.2035c
Frank Parsons Paper Co.	.1731c

50% Manifold, White and Colored

No. 87—30,000 lbs., white, No. 18; flat, cut 21x32, 28x34, 32x42, and 34x44 ins.

Walker Goulard Plehn Co.	.1998c
Paper Corp. of U. S.	.2521c
Old Dominion Paper Co.	.22418c
Butler Co.	.19758c
Graham Paper Co.	.1989c
R. P. Andrews Paper Co.	.2655c
! Barton, Duer & Koch Paper Co.	.1865c

No. 89—20,000 lbs., blue, buff, cherry, green, pink, salmon, and yellow, No. 18; flat, cut 28x34 and 34x44 ins. Min. order, one color, 10,000 lbs.

Walker Goulard Plehn Co.	.2043c
Paper Corp. of U. S.	.2591c
Old Dominion Paper Co.	.23417c
Butler Co.	.21756c
Graham Paper Co.	.2225c
R. P. Andrews Paper Co.	.27c
* Barton, Duer & Koch Paper Co.	.199c

50% White Glazed Manifold

No. 91—40,000 lbs., No. 16. Flat, cut 32x42 ins. Min. order, 20,000 lbs.

Walker Goulard Plehn Co.	.233c
Paper Corp. of U. S.	.272c
* Butler Co.	.21734c
Graham Paper Co.	.232c
R. P. Andrews Paper Co.	.2885c
Barton, Duer & Koch Paper Co.	.2238c

25% Bond, White and Colored

No. 105—80,000 lbs., white, No. 26. Flat, cut any size, min. width 21 ins., max. width 48 ins.

Howard Paper Mills (Aetna Div.)	.1604c
* Stanford Paper Co.	.155c
Walker Goulard Plehn Co.	.171c
Mudge Paper Co.	.1639c
Pulp & Paper Trading Co.	.1688c
Barton, Duer & Koch Paper Co.	.1592c
Frank Parsons Paper Co.	.1669c
D. L. Ward Co.	.1672c

No. 106—300,000 lbs., white, No. 32; flat, cut any size, min. width 21 ins., max. width 48 ins.

* Howard Paper Mills (Aetna Div.)	.1398c
Stanford Paper Co.	.149c
Walker Goulard Plehn Co.	.1477c
Birmingham & Prosser Co. (150,000 lbs. only.)	.1439c
Birmingham & Prosser Co. (150,000 lbs. only.)	.1459c
Whitaker Paper Co.	.1488c
Pulp & Paper Trading Co.	.1418c
Graham Paper Co.	.1479c

No. 109—400,000 lbs., No. 40; flat, cut any size, min. width 21 ins., max. width 48 ins.

* Howard Paper Mills (Aetna Div.)	.1314c
Stanford Paper Co.	.144c
Walker Goulard Plehn Co.	.1427c
Pulp & Paper Trading Co.	.1396c
Butler Co. (150,000 lbs. only.)	.13888c
Butler Co. (150,000 lbs. only.)	.14018c
Butler Co. (100,000 lbs. only.)	.14216c
R. P. Andrews Paper Co.	.1443c
Frank Parsons Paper Co.	.1397c

No. 113—40,000 lbs., blue, buff, cherry, green, pink, salmon, and yellow, No. 32. Flat, cut any size, min. width 21 ins., max. width 48 ins.

* Howard Paper Mills (Aetna Div.)	.1444c
Stanford Paper Co.	.156c
Walker Goulard Plehn Co.	.1474c
Birmingham & Prosser Co.	.1489c
Pulp & Paper Trading Co.	.156c
Chicago Paper Co.	.157c
Barton, Duer & Koch Paper Co.	.1495c

(Continued on page 18)

GPO Bids Opened

(Continued from page 17)

No. 114—30,000 lbs., blue, buff, cherry, green, pink, salmon, and yellow, No. 40. Flat, cut any size, min. width 21 ins., max. width 48 ins.

* Howard Paper Mills (Aetna Div.)	.1354c
Stanford Paper Co.	.1515c
Walker Goulard Plehn Co.	.1474c
Birmingham & Prosser Co.	.1472c
Pulp & Paper Trading Co.	.1542c
Chicago Paper Co.	.151c
Barton, Duer & Koch Paper Co.	.1495c

Chemical Wood White Ledger

No. 150—60,000 lbs., No. 48. Flat, cut any size, min. width 17 ins., max. width 48 ins.

Walker Goulard Plehn Co.	.1299c
Eastern Corp.	.1436c
Paper Corp. of U. S.	.1258c
Whitaker Paper Co.	.1313c
* Pulp & Paper Trading Co.	.124c
Central Ohio Paper Co.	.1278c
Butler Co.	.13c
Wilcox Walter Furlong Paper Co.	.1274c

No. 153—40,000 lbs., No. 88. Flat, cut any size, min. width 17 ins., max. width 48 ins.

Walker Goulard Plehn Co.	.1299c
Eastern Corp.	.1436c
* Pulp & Paper Trading Co.	.124c
Central Ohio Paper Co.	.1278c
Wilcox Walter Furlong Paper Co.	.1266c

25% Ledger, White and Colored

No. 154—100,000 lbs., white, No. 48; flat, cut 28x34, 32x42, 34x44, and 38x48 ins. Min. order, 10,000 lbs.

* Howard Paper Mills (Aetna Div.)	.1424c
Stanford Paper Co.	.1497c
Walker Goulard Plehn Co.	.1524c
Baxter Paper Co.	.1526c
Mudge Paper Co.	.1437c
Paper Corp. of U. S.	.176c
Pulp & Paper Trading Co.	.1468c
Barton Duer & Koch Paper Co.	.1624c

No. 157—30,000 lbs., blue, buff, cherry, green, pink, salmon, and yellow, No. 64. Flat, cut 34x44 ins. Min. order, one color, 10,000 lbs.

* Howard Paper Mills (Aetna Div.)	.1484c
Stanford Paper Co.	.1597c
Walker Goulard Plehn Co.	.1575c
Baxter Paper Co.	.1595c
Mudge Paper Co.	.1534c
Paper Corp. of U. S.	.1815c
Pulp & Paper Trading Co.	.1783c
Barton Duer & Koch Paper Co.	.149c

No. 158—30,000 lbs., blue, buff, cherry, green, pink, salmon and yellow, No. 88. Flat, cut 34x44 ins. Min. order, one color, 10,000 lbs.

* Howard Paper Mills (Aetna Div.)	.1484c
Stanford Paper Co.	.1597c
Walker Goulard Plehn Co.	.1575c
Baxter Paper Co.	.1625c
Paper Corp. of U. S.	.1815c
Pulp & Paper Trading Co.	.1783c
Barton Duer & Koch Paper Co.	.149c

100% White Ledger

No. 176—10,000 lbs., No. 48. Flat, cut 28x34, 32x42, and 34x44 ins. Min. order, 4,000 lbs.

Walker Goulard Plehn Co.	.29c
Mudge Paper Co.	.2849c
R. P. Andrews Paper Co.	.3348c
* Barton, Duer & Koch Paper Co.	.275c

Chemical Wood, White and Colored Index

No. 182—100,000 lbs., white, 25½x30½—220; flat, cut 34x44 ins., with projecting colored-paper marker between each 100 sheets. Min. order, 10,000 lbs.

Walker Goulard Plehn Co.	.1098c
Whitaker Paper Co.	.1079c
* Pulp & Paper Trading Co.	.1068c
Wilcox Walter Furlong Paper Co.	.1359c
Frank Parsons Paper Co.	.1086c

No. 183—20,000 lbs., white, 25½x30½—280; flat, cut 34x44 ins., with projecting colored-paper marker between each 100 sheets. Min. order, 10,000 lbs.

Walker Goulard Plehn Co.	.1215c
Whitaker Paper Co.	.1079c
* Pulp & Paper Trading Co.	.1068c
Wilcox Walter Furlong Paper Co.	.1373c

50% Index, White and Colored

No. 188—275,000 lbs., white, 25½x30½—220; flat, cut 32x42, and 34x44 ins., with projecting colored-paper marker between each 100 sheets. Min order, 10,000 lbs.

* Howard Paper Mills (Aetna Div.)	.1469c
Walker Goulard Plehn Co.	.15c
Mudge Paper Co.	.196c
Paper Corp. of U. S.	.189c
Pulp & Paper Trading Co.	.1589c
Butler Co. (Size 34 x 57 skids)	.14953c
Butler Co. (Size 34 x 57 skids)	.15258c
Butler Co. (34 x 57 cases)	.15656c
R. P. Andrews Paper Co.	.1725c
Barton Duer & Koch Paper Co.	.1486c

No. 191—80,000 lbs., blue, buff, cherry, fawn, green, pink, salmon, and yellow; 25½x30½—220; flat, cut 34x44 ins., with projecting colored-paper marker between each 100 sheets. Min. order, one color, 10,000 lbs.

* Howard Paper Mills (Aetna Div.)	.1509c
Walker Goulard Plehn Co.	.1627c
Paper Corp. of U. S.	.193c
Pulp & Paper Trading Co.	.1632c
R. P. Andrews Paper Co.	.175c
Barton Duer & Koch Paper Co.	.156c

100% White Index

No. 196—30,000 lbs., 25½x30½—250; flat, cut 20¼x30 ins.

Walker Goulard Plehn Co.	.2765c
Paper Corp. of U. S.	.276c
Pulp & Paper Trading Co.	.26c
R. P. Andrews Paper Co.	.3321c
* Barton, Duer & Koch Paper Co.	.26c

Antique-Finish Cover, White and Colored

No. 202—20,000 lbs., white, 20x26—100. Flat, cut 25¼x39 inches.

Stanford Paper Co.	.12c
Whitaker Paper Co.	.14c
* Pulp & Paper Trading Co.	.1187c
R. P. Andrews Paper Co.	.1325c
Wilcox Walter Furlong Paper Co.	.1292c

No. 203—30,000 lbs., 20x26—100; blue, buff, dawn, quaker drab, terracotta, gray, brown, green, gobelin blue, granite, tea, and yellow; flat, cut 25¼x39 inches. Min. order, one color, 10,000 lbs.

* Stanford Paper Co.	.127c
Whitaker Paper Co.	.14c
R. P. Andrews Paper Co.	.1325c

50% Laid Cover, Colored

No. 206—40,000 lbs., blue, cream, white, gray, and green; 20x26—130; flat, cut 25¼x39 and 28x41 inches. Min. order, one color, 2,000 lbs.

Paper Corp. of U. S.	.186c
* R. P. Andrews Paper Co.	.1847c

Wood Manila

No. 208—30,000 lbs., 24x36—80; flat, cut 25x38, and 32x42 inches.

Walker Goulard Plehn Co.	.1015c
* Barton, Duer & Koch Paper Co.	.101c

No. 210—50,000 lbs., 24x36—80; rolls, 21 ins. wide (3-inch fiber cores).

Walker Goulard Plehn Co.	.1103c
Barton Duer & Koch Paper Co.	.096c
* Frank Parsons Paper Co.	.0808c

Chemical Wood Manila

No. 213—10,00 lbs., 24x36—140; flat, cut 32x42 ins. Min. order, 10,000 lbs.

Rope Manila

No. 216—10,00 lbs., 24x36—280; rolls, 48 ins. wide (3-inch fiber cores). Min. order, 10,000 lbs.

Paper Corp. of U. S.	.3845c
* R. P. Andrews Paper Co.	.31c

Drumhead Manila

No. 217—10,000 lbs., 24x36—280. Flat, cut 32x42 ins. Min. order, 10,000 lbs.

Paper Corp. of U. S.	.4027c
* R. P. Andrews Paper Co.	.315c

No. 2 Kraft

No. 218—20,000 lbs., 24x36—120; flat, cut any size in wrapped bundles.

Whitaker Paper Co.	.09c
* Cauthorne Paper Co.	.08739c

White Gummed

No. 252—50,000 sheets, (ungummed), No. 40; flat, cut 22x34 ins. Min. order, 25,000 sheets.

Stanford Paper Co.	$24.80 per M sheets
Bulkley Dunton Co.	$24.90 per M sheets
Mudge Paper Co.	$25.80 per M sheets
Paper Corp. of U. S.	$23.69 per M sheets
Old Dominion Paper Co.	$23.588 per M sheets
Butler Co.	$23.69 per M sheets
* R. P. Andrews Paper Co.	$22.87 per M sheets

Jute Tag

No. 281—15,00 lbs., 22½x28½—280; flat, cut 34x44 ins. Min. order, 10,000 lbs.

* Walker Goulard Plehn Co.	.172c
Paper Corp. of U. S.	.172c
R. P. Andrews Paper Co.	.1725c

White Litho-Coated One-Side Cardboard

No. 300—15,000 lbs., flat, cut 34x57 and 34x43 ins. Min. order, 10,000 sheets.

Stanford Paper Co.	$115.37 per M sheets
* Walker Goulard Plehn Co.	$113.49 per M sheets—size 34 x 57 skids
Walker Goulard Plehn Co.	$127.00 per M sheets—34 x 57 cases
* Walker Goulard Plehn Co.	$85.845 per M sheets—size 34 x 43 skids
Walker Goulard Plehn Co.	$ 96.00 per M sheets—34 x 43 cases
Barton Duer & Koch Paper Co.	$114.25 per M sheets

Railroad Board, White and Colored

No. 305—10,000 lbs., buff, flat, 22x28 ins., 14-ply, each 50 sheets fully banded. Min. order, 5,000 sheets.

Stanford Paper Co.	$100.69 per M sheets
Old Dominion Paper Co.	$ 99.989 per M sheets
* Barton, Duer & Koch Paper Co.	$ 99.71 per M sheets

Wood Cardboard, Colored

No. 307—40,000 lbs., buff, 22½x28½—150; flat, cut 32x42 ins.

Walker Goulard Plehn Co.	.1059c
Pulp & Paper Trading Co.	.0998c
Barton Duer & Koch Paper Co.	.1085c
* Frank Parsons Paper Co.	.0909c

No. 308—10,000 lbs., melon; 22½x28½—184. Flat, cut 20x30 ins., in wrapped bundles with projecting colored-paper marker between each 100 sheets.

* Walker Goulard Plehn Co.	.1261c

No. 309—30,000 lbs., blue, buff, green, melon, pink, and yellow; 22½x28½—184. Rolls, 20 ins. wide (3-inch fiber cores).

* Walker Goulard Plehn Co.	.1094c

Chemical Wood Tan Board

No. 310—60,000 lbs., 22½x28½—200; flat, cut 25x38, 28x38, and 34x44 inches.

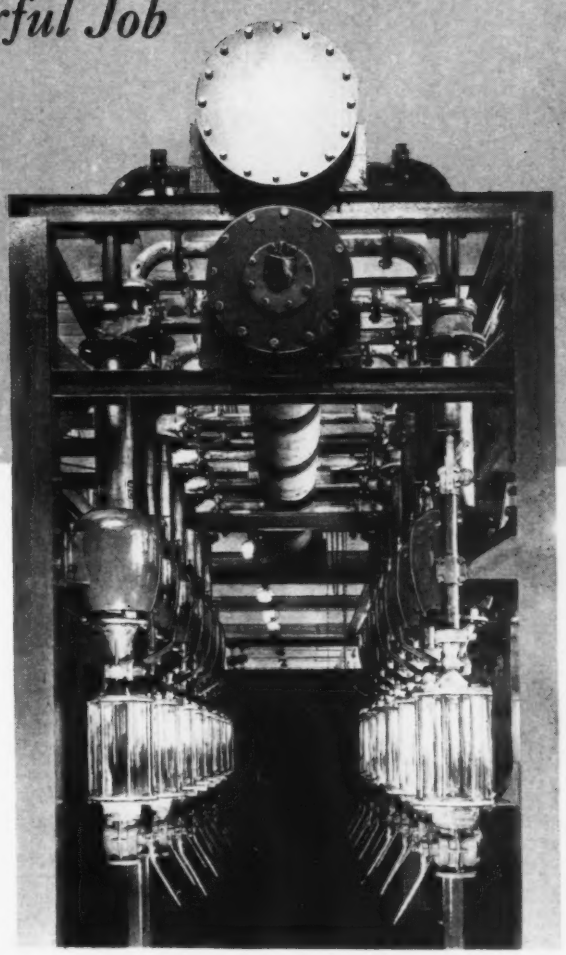
Walker Goulard Plehn Co.	.1399c
* Paper Corp. of U. S.	.1359c
Pulp & Paper Trading Co.	.1432c
R. P. Andrews Paper Co.	.1365c
Frank Parsons Paper Co.	.1545c

(Continued on page 52)

DIRTECS

Are Doing A Wonderful Job Of Dirt Removal

In Mill
After Mill
After Mill



DIRTECS do get the dirt, and get it out of the papermaking system for good and all.

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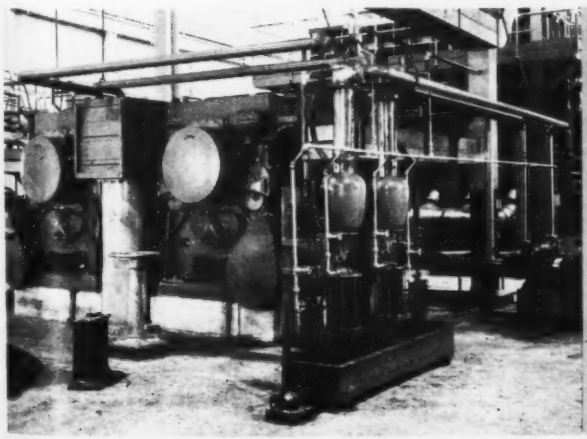

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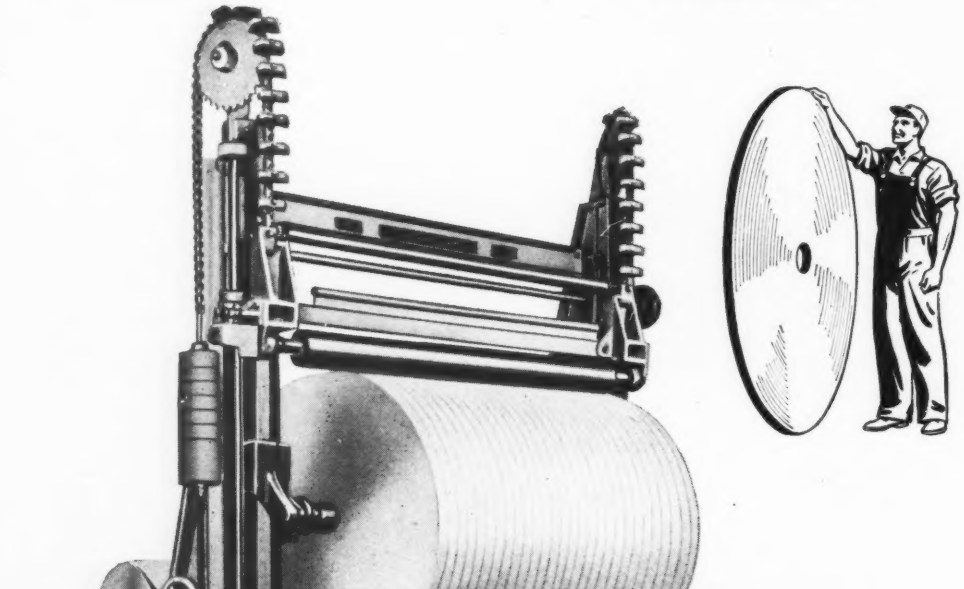

Camachine 10-14D

NARROW ROLLS of large diameter call for the job-proved Camachine 10-14D—a high-speed, heavy-duty slitter and rewinder *specially* designed for dependable, low-cost production of extra-narrow, large diameter rolls of paper and paperboard. The 10-14D produces top-quality narrow rolls as large as 72" in diameter at speeds up to 1500 fpm on paper, or 1000 fpm on board, speeds depending upon the caliper of the board and the tension required on the web. Rolls may be 'hard' or 'soft', as desired, but uniform density is assured by constant web tension control.

The extra-rugged rewind drum, driven riding roll, and the quick respacing of cutter units are among the features which have made Camachine 10-14D so outstandingly popular in leading paper converting and paper goods manufacturing plants, everywhere.

Extensive Camachine engineering, research and manufacturing facilities are devoted exclusively toward producing the world's most efficient slitting and roll-winding equipment. For practical advice it pays to consult a Camachine *specialist.*

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AA-190

The Mechanical Seal

—*Its Construction, Application, and Utility*

By CARL E. SCHMITZ

Vice-President and Director of Engineering, Crane Packing Co., Chicago, Ill.

This paper outlines important construction features of the Mechanical Seal; discusses speed, pressure, temperature, and viscosity; application considerations, advantages, and when special construction desirable; utility of the Mechanical Seal; suggested Services.

As a rather general statement all Mechanical Seals are basically composed of a rotating and stationary element, and some means of keeping them in contact. (*See Figure 1*).

As the number of and kinds of seals and their utility are appreciated by Mechanical Engineers, the number of papers and articles on the subject is increasing. The need for a better understanding of construction, application, and utility of this important mechanical device is becoming keener, and this paper is especially directed toward those important factors.

Construction

Of primary consideration is the vital matter of construction, and here are involved these important factors: (1) Flexibility; (2) Surface finish of the mating faces; (3) Positive driving means; (4) Metallurgy; (5) Engineering, Laboratory testing, and Research.

These factors are not necessarily arranged in their order of importance. Each is an important factor, all of which properly coordinated go to make the most successful seal for the widest range of applications.

Since each mechanical device to which a seal is applied has manufacturing tolerances, the seal itself must have manufacturing tolerances. It will, therefore, become immediately evident that flexibility is an important consideration. It is impossible to hold manufacturing axial tolerances below plus or minus .005, and this even in so-called precision equipment. Many high production items run as high as plus or minus .020. Thus it becomes obvious that when initially installed a good Mechanical Seal must be able to compensate for this axial tolerance, to which must be added the overall length tolerances of the seal manufacturer, which on high production items it is impractical to hold closer than plus or minus .015. It is evident that one might run into a condition of having to meet a total axial tolerance of plus or minus .035, and this is a conservative figure since within the experience of many engineers conditions of greater severity have been met. (*See Figure 2*).

Contributed by the Machine Design Division for presentation at the Annual Meeting of The American Society of Mechanical Engineers, New York City, November 29-December 3, 1948.

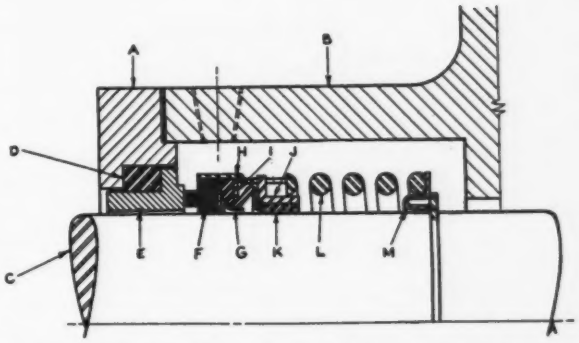

Figure 1—Typical mechanical seal applied to a conventional stuffing box or other mechanical device. Nomenclature of parts. (a) Gland Plate or cover (b) Stuffing Box (c) Shaft (d) Floating Seat Ring (e) Floating Seat (f) Sealing Washer (g) Shaft Protecting Ferrule (h) Retainer Shell (i) Bellows Flange Retainer (j) Driving Band (k) Synthetic Rubber Bellows (l) Spring (m) Spring Retainer.

There is another factor wherein flexibility is important, and that refers to radial tolerances which frequently range from plus or minus .002, almost the minimum, to as high as plus or minus .005, and again these are reasonably conservative figures. The properly constructed Mechanical Seal, once set up in the installation, must somehow possess sufficient flexibility to compensate for wear at the contacting faces. Since wear is somewhat unpredictable, varying under several conditions of service, it is apparent that perhaps of highest importance in good Mechanical Seal construction is flexibility. To insure the maximum of life, provisions for not less than .090 wear should be made, since when that much wear occurs, the seal has lost its utility and should be replaced.

As an example of just what a good seal might be called upon to do, a manufacturer contemplating the use of Mechanical Seals made an experimental hook-up and as the shaft was rotated, struck it with a hammer and threw out any seal that leaked under this test. The radial movement of the shaft when the hammer blow fell was in the neighborhood of .035. Needless to say, many seal

TECHNICAL DEVELOPMENT

Paper Trade Journal, in this section, makes space available for discussion of technical and operating problems. Space is also available for the presentation of independent studies and research on technical and engineering subjects. Feature stories of paper mills, converting plants and inter-related industries will be included. An invitation is cordially extended to all who are qualified to discuss these subjects. Original manuscripts submitted exclusively to Paper Trade Journal and found suitable for use in this section will be paid for immediately upon acceptance. Submit manuscripts to E. P. McGinn, Industrial Editor.

designers and manufacturers had their products thrown out. This may seem a hard and unjustifiable test. In many mechanisms the shock and work load conditions are such as to impose axial movement of considerable consequence.

A spring or series of springs are usually employed to keep the seal faces in contact as required to compensate for axial or initial tolerance. High loading will usually result in heating and excessive wear of the seal faces. The flexing members must, therefore, be so designed as to require low pressure to assure proper movement under installation and operating conditions. Materials used must be such that they will not "work harden" and crystallize as do so often thin metallic structures.

Especially compounded synthetic rubbers provide about the best flexing members. While other materials have been used, they are frequently discarded as not too satisfactory insofar as life and general good service are concerned. In addition to having a flexing member that will withstand considerable axial movement with the least possible effort, it is further necessary that the component parts of a good seal must be so designed as to permit the flexing member to move radially and axially freely and under all conditions of operation.

The seat, usually stationary, should be so mounted in flexible materials that tightening of bolts or glands can in no way distort the closely lapped faces. Relatively heavy sections of iron or steel may be distorted by the pressure of one's hand so as to throw a closely lapped face considerably off flatness requirements and good seal practice. Some mechanical devices are still designed to use so-called solid end plates, but these are rapidly being discarded in favor of the floating seat. Floating, as it does entirely in a synthetic resilient ring, imposes no detrimental stresses beyond the flatness requirement and further permits ready replacement at minimum cost. Such seats are easily adaptable to most mechanical devices, and permit the seal user to purchase the whole unit from one source. A progressive seal manufacturer now supplies a complete seal unit including a factory lapped and inspected stationary seat and rotating seal washer, and all having the required flexibility to meet the wide variety of operating conditions encountered.

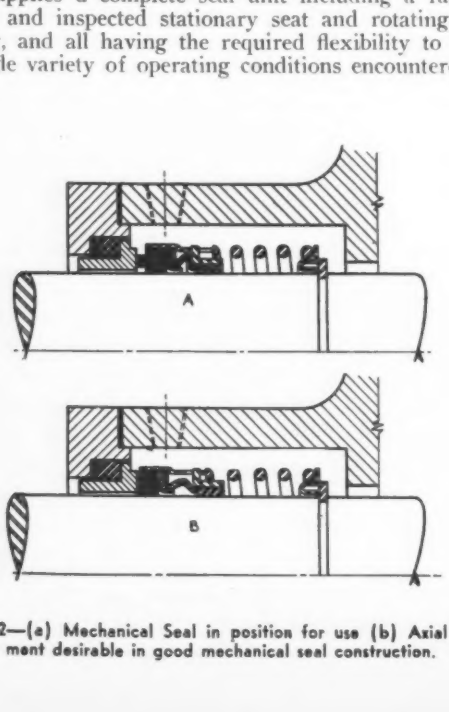

Figure 2—(a) Mechanical Seal in position for use (b) Axial movement desirable in good mechanical seal construction.

Surface Finish of the Mating Faces

Much has been written and said about surface finishes, first perhaps in regard to ordinary bearings where conditions are somewhat easier than encountered with seal faces. In one instance the rolling action of the shaft in the journal tends to roll in and on the lubricant, whereas seal faces are usually set in a vertical plane and present a somewhat more difficult problem insofar as introducing proper lubricating films. Before the art of lapping and obtaining highly polished and parallel faces was commercially feasible, seal manufacturers used to ship seals and include with them a container of abrasive with instructions to set up the seal and put the abrasive paste between the faces, and thus wear them in. In rare instances some seal manufacturers follow this practice even today, but such practice is inconsistent with the trend and development of precision lapping equipment. The manufacturer recommending the abrasive paste between the seal faces never told the user how to remove the abrasive material from between the seal faces once its mission was accomplished, nor was any explanation given as to the effect of this abrasive material entering the oil or product handled. High surface finish eliminates the old so-called "break-in" period, permits more efficient and effective lubrication by developing conditions that will eliminate oil film failure by rupture through surface to surface contact. Costly experimentation and much research was necessary to work out the problem of equipment for producing at high speed satisfactory surfaces on the mating face of the seat and washer.

Nor was the selection of equipment all of the problem. Technique of handling and conditioning of lapping fluids —stress relieving, and product handling were also to be worked out to make the process adaptable to high speed production requirements. There are two main objectives in the production of a good mating or bearing surface: The one, "Metallurgical" is to remove the defective metal at the surface previously produced by the shaping or dimensioning operations and expose the true crystals of the material actually bisected so as to have an extremely fine plane surface; and the other, "Geometrical", is to remove the hills and valleys, (scratches and/or flaws), and by the laws of physics to generate a true and smooth surface which will eliminate the danger of film rupture and material to material contact that only leads to increased friction wear and failure.

The following test data compiled by the Massachusetts Institute of Technology may be of interest to Mechanical Engineers: This test was run to demonstrate the failure point of load carrying capacity of the oil in a conventional bearing. The oil used had a viscosity of 150 seconds at 110 degrees Fahrenheit, and was Grade M. S. 782. The shaft speed was 950 R.P.M. With a finish of from 22 to 28 micro inches, the failure point was an average of 71 pounds. With a finish of from 8 to 10 micro inches, the failure point was 153 pounds average. With a finish of from 0 to 2 micro inches, the failure point was 217 pounds average. While these figures may not be wholly applicable to vertically running faces, they are at least indicative of what takes place with regard to seal faces.

It was early discovered that R.M.S. specification, while important, was not the only problem to be considered. Flatness of the whole surface area is also important, and to this end optical flat inspection is required. Many scientific and engineering organizations are doing work on surface finishes. Among those interested and working with the problem are the National Bureau of Stand-

ards, Society of Automotive Engineers, and National Aircraft Standards Committee.

Equipment to evaluate surface conditions is being improved and made available to those interested in precision manufacturing. Principal among the manufacturers of such equipment are the Physicists Research Co., Brush Development Co., and Comtor Co., and the several manufacturers of optical flats. The progressive seal manufacturers inspect all lapped surfaces manufactured by them with optical flats — spot checks will not suffice. One hundred percent inspection of each and every part that is manufactured is necessary to assure users the best possible in the way of precision faces, optically flat, smooth, and thus designed to give the maximum of efficient long life. Lately some experimental work is being done with so-called liquid honing whereby abrasives ranging from 400 to 600 mesh are forced against the sealing faces at extremely high velocities. It is yet too early to predict whether or not this surface treatment will be beneficial insofar as seal construction and production are concerned.

Positive Driving Means

A means of so driving the seal that none of the torque load can be or is imposed on the flexing member, whether it be of metallic or synthetic materials, is important. *(See Figure 3).* The washer or usually moving face may require considerable break out torque and if the flexing member is called upon to carry any part of this load or the running load it soon crystallizes, especially if the membrane is metallic. If of synthetic rubber, internal abrasion and constant flexing causes the material to thus rapidly break down and seal failure of course results.

Good practice requires that the flexing member must be so constructed to permit close contact of the faces to compensate for wear. High p.s.i. loading tends to exclude the thin lubricating film. The manufacturers of many seals on the market today attempt to use high spring pressure and thus impose the driving torque load on the spring. This frequently results in chattering, poor seal life, and general dissatisfaction.

Metallurgy

Good general metallurgy necessitates selection of proper materials to withstand the medium in which the seal operates. This problem is not too severe in most industrial equipment, brass and steel being most commonly used and serve well in most oils, water, greases, and hydrocarbon distillates. Seals are finding an ever increasing use in the highly complex chemical industries where corrosion is a common problem. In these instances stainless steel is used. However, in considering seal metallurgy, of highest importance are the washer and seat material combinations. For most industrial installations a good grade of cast iron with carbon or synthetic resin bonded graphite and metal combinations make for long, satisfactory life. Such combinations are widely used in refrigeration service and are well suited for relatively high speed industrial applications where the principal problem is to hold a lubricating medium and perhaps gases such as are commonly employed in the refrigeration field. Carbon and bronze serve well for problems involving water. Meehanite and Ni-Resist run well with carbon combinations in certain types of installations. In highly specialized services Stellite, steel, ceramics, and a host of other materials are run in various combinations which testing and field service demonstrate are best suited. As the need for and use of seals continue to increase, new combinations of materials are being tried. Almost every known, combination of metal, carbon and ceramic product are experimented with and then used in actual installations after research and laboratory testing reveal that there is a possibility of such materials being employed to the advantage of the seal user.

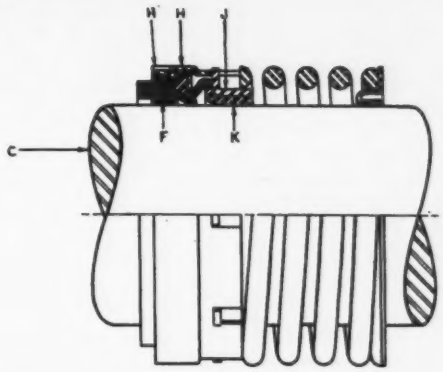

Figure 3—Synthetic rubber bellows (k) adheres to shaft (c) and drives driving band (j) which drives retainer shell (h). Driving notches H' in retainer drives washer (f).

Engineering—Laboratory Testing—and Research

A seal can only be as good as the engineering, testing, and research that goes into it. Engineering involves not only applications but structural designs as well. No reference work being available, all developments must go through extensive laboratory testing to prove or disprove their utility. As an example, the matter of mating face widths. A start is made with what seems theoretically practical, and then by actually testing various combinations of wider and narrower faces. Each one, after the original idea, must be tried until at last the most desirable is selected for operation in a given material at selected speed, temperature, and pressure. Handling another material may so change the results that another complete set of tests are necessary.

Testing should not be confined to any one particular type of equipment. A good variety of pumps and mechanical appliances should be available so that tests can be conducted over a rather wide range of services, and thus establish the most practical seal construction for the specific problem. There should be available in the Mechanical Testing Laboratory means of testing under a wide variety of speed, pressure, and temperature conditions. Each test should be carefully recorded and the seal so tested, carefully catalogued, and available at some later date for observation, should it be necessary.

The Engineering organization should be comprised of those who are especially trained in making applications to a wide variety of mechanical problems. It should include specialists in application principles, and others who are specialists in the art of design for development of the various parts that go to comprise the seal itself.

Supporting the Engineering Department and the Mechanical Testing Laboratory should be the facilities of a completely equipped Research Laboratory to analyze various materials to be handled and assist in selecting best suited construction materials for any given problem. All this assures the user of Mechanical Seals the best equipment that money can buy.

Summarizing, "A look inside the seal," calls attention to these outstanding requirements for assurance of good service and a product worthy of consideration: (1) Flexibility; (2) Surface finish of the mating faces; (3) Positive driving means; (4) Metallurgy; and (5) Engineering, Laboratory Testing, and Research.

The progressive manufacturer offers you no less in attempting to solve your seal problem.

Speed

Speed is of interest to the prospective seal user, especially in some of the newer mechanical appliances where speeds of 10,000, 15,000, and 20,000 R.P.M. are being rather generally considered. Tests so far conducted seem to indicate that about 12,000 R.P.M. or 5,000 F.P.M., (whichever is the lower), at the seal faces are about the maximum that can be tolerated. The mechanical appliance to which the seal is to be applied, and the liquid to be sealed are factors that materially influence maximum speeds permissible.

The problem of excessive speed is not generally encountered in centrifugal pumps where 3600 to 4000 R.P.M. are most generally used. In positive displacement pumps speeds rarely exceed 1,200 R.P.M., and, therefore, speed insofar as the Mechanical Seal is not too important in this type of equipment. Centrifugal blowers having shaft speeds of from 6,000 to 9,000 R.P.M. present a real problem for the seal designer owing to the large shaft sizes usually involved. Progress is being made and each new requirement above established known practice leads to new research and study.

Spring behavior must be studied when considering speed limits, since experience has shown that springs behave rather unexpectedly under the influence of centrifugal force. The strobascope proves a handy instrument in this investigation. By running loaded springs at various speeds, the behavior of any particular spring or series of springs can be observed and designs arranged to suit the required condition.

Recommendations for Seat and Washer Material

Since there is little data available concerning the best suited washer and seat materials and since these parts running together do not follow the pattern of the sleeve bearing, elaborate tests should be setup and run to determine the best suited materials for any given set of conditions. Carbon products which include various grades which are filled with metals, carbon, or some synthetic substance or synthetically bonded carbon, asbestos, metal combinations, make for less friction and show good wearing qualities under general service conditions, and are widely used.

Viscosity

It has been determined that viscosity plays an important part in seal construction. Tests indicate that up to 300 S.U.S., standard seal construction can be used. Over 300 S.U.S., special study and experimental work is necessary. Work thus far indicates that as viscosity increases, spring pressures should be increased to prevent excessive increase in film thickness since if the film thickness increases then ability to hold the liquid decreases.

The major number of seal installations, falling as they do in the viscosity range of 300 S.U.S. and under, no exhaustive study has yet been undertaken. It is hoped that in the not too distant future this subject can be studied and a report of the findings issued at that time.

Dry Running

So-called dry running must be avoided in mechanical seal usage since the materials used for seat and washer tend to distort or abrade at the elevated temperatures generated.

It is recommended that provision be made to insure liquid in the seal chamber at all times. In mechanisms other than pumps, usually the liquid sealed can be brought in constant contact with the seal faces.

No combination of materials has yet been discovered that can tolerate dry running for more than a few minutes duration. This situation must be carefully watched when handling materials that lose liquid phase under certain conditions of temperature and pressure. When handling extremely volatile liquids, pressure in the seal chamber must be maintained sufficiently high to insure liquid phase at all times.

Pressure

The properly designed mechanical seal can be used for a wide range of pressure conditions. Standard seals can be used for vacuum service down to .5 mm of Hg absolute, and on pressures up to 200 p.s.i. gauge without difficulty and covering any liquid in which a seal can be operated. Mechanical Seals were used on the 2500-ton Cyclotron at Columbia University where vacuum down to 10-5 mm of Hg had to be constantly maintained, primarily to give the swiftly moving ions a free path of movement. When pressures of over 200 p.s.i. gauge are encountered in the seal chamber, balanced seal construction is recommended.

The balanced seal is so constructed that the seat and washer faces are in pressure balance. The hydraulic pressure within the seal cavity is so disposed as to balance itself and thus only the usual spring loading is necessary to compensate for wear. Longer life, less friction, lower heat generation, and minimizing power requirements are the result of balanced seal usage. Complete balance is not advocated. Balancing out to within from ten to fifteen percent is suggested so as to prevent poppett valve action under shock loads. The Mechanical Seal is not handicapped by pressure shock or pulsation. Pressures up to 1000 p.s.i. gauge can regularly and safely be handled. Higher pressures can be handled, but here again special design and construction are required.

Application

In considering the problem of applying the Mechanical Seal, nearly always the prospective user comes to the manufacturer with the design of his equipment already worked out. Space requirements held to the very minimum, this usually based on some preconceived idea of what ought to do the job. After initial tests are run the seal selected for solution of the problem falls short of the needs and a solution must be sought, usually hedged with this statement: "Anything used must fit into the already existing space," which is usually further limited and too small in both axial and radial dimensional requirements for application of the proper Mechanical Seal.

Engineers having sealing problems would do well to submit the problem in the early design stages so as to avoid redesign and costly later changes. In a great many instances considerable savings can be had by embodying construction applicable and already widely used when Mechanical Seals are employed. Of special interest to Mechanical Engineers and the progressive equipment builder is the use of a combination of talents in the early

development stages, since a properly sealed unit may be constructed to use: (1) A more expensive lubricant better suited to the problem and employ seals to prevent loss of the lubricant. (2) A lubricant of lower viscosity since it can be satisfactorily held by seals. (3) Eliminate costly filtering and accompanying equipment since seals prevent contamination of oil in the system. (4) Freedom from fire and personnel hazards when handling either explosive or toxic materials. (5) Provide freedom from necessity for frequent adjustment of glands and this often in the hands of inexperienced personnel. (6) Full utilization of input power for the pump.

Applications have been worked out for hundreds of appliances, and layouts are available without cost on the part of the potential seal user. However, to obtain the most satisfactory performance the Mechanical Seal must be carefully selected and applied, and when so used will give years of satisfactory service without attention or adjustment. A big factor in favor of using Mechanical Seals is that they entirely eliminate the human element. Once properly installed, no adjustment is required and they can be forgotten.

In making applications care should be exercised to insure the pump material or lubricant contacting the seal faces. Early packing designs employed many ingenious devices to keep the lubricant or material sealed away from the gland. In applying seals the exact opposite practice should be employed. Higher oil levels should and can be maintained, and the equipment manufacturer who uses seals intelligently can point out to the customer the considerable savings that can be had in maintenance and replacement of the lubricant.

The machine designer must keep in mind that shaft rigidity is important, and deflection kept to the minimum since various changes take place in iron and steel parts if load is applied and taken off. If the load were steady, deflection would not present too great a problem, but it is the constant changing with operating conditions that complicates the matter. Proper alignment makes for better and longer equipment life. Its importance cannot be disregarded when applying Mechanical Seals.

Double seals are often advantageously applied, especially to overcome corrosion problems or when materials containing large percentages of solids are handled. Some lubricating medium must be circulated between the double seals so as to provide proper lubrication for the seal faces, and to carry away such heat as is generated. These installations are widely used in paper mills, chemical plants, or when handling highly irritating gases. On such installations the Mechanical Engineer is called upon to select the oil or liquid circulated through the seal cavity.

Single lubricated face seals are applied to jobs where the pressures and speeds are low and the material handled has poor libricating qualities or contains materials that might be detrimental to the highly polished faces. The lubricating material is introduced through the stationary seat, the seat having a series of holes leading from the face to the lubricating material supply labyrinth. Lubrication is applied usually by means of a spring loaded grease cup using light especially designed grease; or oil which is introduced by a circulating pump or from a gravity storage supply, whichever is indicated to be the best based on Laboratory and field tests for the particular problem at hand.

Utility

The Mechanical Seal has already demonstrated its utility in many industries and on a wide variety of equipment. To recite a few, the refrigeration industry was perhaps the first to utilize the effectiveness of the Mechanical Seal, and manufacturers of large and small compressor units have used them for a considerable length of time. There is hardly a progressive refrigeration manufacturer of either large or small units who does not today make full use of the Mechanical Seal. Pump manufactrers everywhere are offering customers the advantage that can be had by their application on pumps for a large variety of services which include:

Domestic Units for the handling of water in small and large well installations.

Paper Mills for handling stocks and black liquor.

General Service Equipment where pumps are called upon to handle brine, quench oil, soluble oil, and a host of applications that will immediately present themselves to you under this category.

Pumps on Transcontinental Pipe Lines where conventional mechanical packing meant tolerating rather excessive leagage which resulted in a serious problem of repumping that leakage into the pipe lines.

On Pumps in Petroleum Refineries where conditions present a host of problems, in fact, pump manufacturers are today recommending seals on every conceivable type of unit in the processing industry.

Speed Reducer Manufacturers have long felt the need of freedom from gland leakage and most progressive manufacturers are now using the Mechanical Seal.

Manufacturers of Agitators and Vacuum Processing Equipment find the Mechanical Seal a solution to many of the problems that have previously troubled them.

The use of seals on the *Coolant Pumps on Internal Combustion Engines* is an important development and today with one or two exceptions, every automobile builder uses seals to the comfort of many automobile owners.

The Diesel Engine Manufacturers are making wide and increasing use of seals on coolant and oil transfer pumps, decreasing "in shop" time and making for cleaner and more efficient operation. Frequently the adoption of Mechanical Seals results in considerable savings, eliminating parts and expensive gland construction. Permits full streamlining and enables important space saving requirements to be made.

Summarizing

Construction is important and every interested prospective user should fully acquaint himself with the desirable factors and necessary requirements for his particular job and insist that the seal used possess all of the desirable factors that go to make up a good seal.

Application of the proper seal to the job is the answer to successful performance. Submit your application problems to a qualified manufacturer before you are too far advanced with construction details. Follow closely layout submitted and approved for the particular job under consideration, and thus assure a successful seal application.

Utility is unlimited and the prospective seal user would do well to deal only with a manufacturer competent and capable of analyzing the specific problem and willing to work with the equipment manufacturer toward a successful fruitation of the problem involved.

Chemical Cleaning of Heat Exchange Equipment

(Abridged)

By C. M. LOUCKS
District Chemist, Dowell Inc., Cleveland 12, Ohio
and
By C. H. GROOM
Development Engineer, Dowell Inc., Tulsa, Okla.

Abstract

The use of chemical solvents in cleaning heat exchange equipment is described on the basic of the types of deposits, the solvents available and the metals encountered. The application of the solvents, is discusssed and a number of case histories described illustrating chemical cleaning in various industries.

It is logical to expect heat exchange surfaces to experience some degree of fouling. When the fouling becomes serious enough to cause appreciable loss in efficiency of heat transfer some measure of corrective maintenance is necessary. This paper concerns the use of chemical solvents for removing the offending deposits and restoring the equipment to satisfactory performance.

The successful and economic application of solvent cleaning depends upon a number of factors; namely, the deposits, the metals in the unit to be cleaned, the solvents available and safe operating practices. It is proposed to discuss these factors as they influence solvent cleaning and to describe the methods of application by citing experiences with solvent cleaning in various industries.

Contributed by the Heat Transfer Division for presentation at the Annual Meeting, New York, N. Y., November 28-December 3, 1948 of The American Society of Mechanical Engineers.

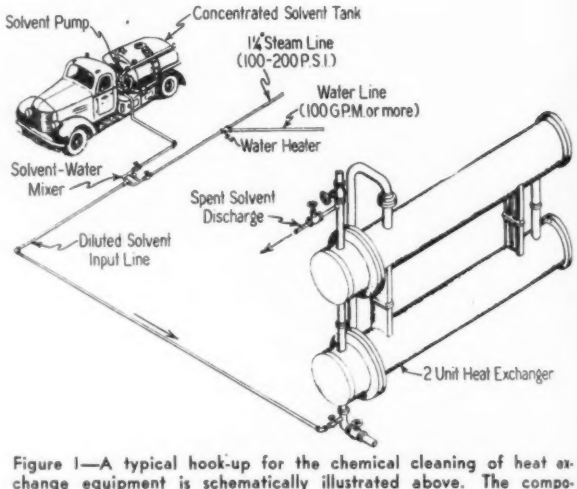

Figure 1—A typical hook-up for the chemical cleaning of heat exchange equipment is schematically illustrated above. The components essential to properly carry out the operation are indicated.

TABLE I

Properties of Metals Encountered in Chemical Cleaning

Ferrous Metals

Cast irons can be cleaned wtih any of the common solvents used for that purpose. When using inhibited acid, however, it is advisable to use lower temperature limits than for low carbon steel.

Carbon and low alloy steels offer good resistance to cleaning solvents, including inhibited acids at rather elevated temperatures. However, it must not be assumed that all carbon and low alloy steels exhibit the same corrosion characteristics in inhibited acids. (7) (8) (9)

Stainless steels are in general, more resistant to corrosion than low alloy steels. This particularly is true of the 18-8 types of chromium-nickel alloys. This is less true of the Chromium stainless steels. Care should be exercised in the use of inhibited acids in contact with the latter.

Galvanized iron cannot be cleaned by either inhibited acids or strong alkalies. Neither should be used unless corrosion has already so nearly destroyed the galvanized coating that its complete removal is of no consequence.

Copper and Copper Alloys

Copper and copper alloys are in general resistant to non oxidizing acids, alkalies and organic solvents.

Nickel and Nickel Alloys

Nickel and nickel alloys are resistant to non oxidizing acids, alkalies and organic solvents.

Aluminum and Aluminum Alloys

Aluminum and aluminum alloys are becoming more extensively used in the fabrication of heat exchange equipment. The solvent cleaning of such equipment must not be attempted with inhibited acid or with strong alkali. Strongly oxidizing acids and mild alkalies may be used.

Tin and Lead

Block tin is seldom encountered but is quite resistant to attack by the common solvents under the conditions employed. The same may be said of lead, which might be used for gaskets, caulking, or special fittings. Further, tin-lead solders are not subject to serious attack.

Deposits

The successful removal of any type of deposit with solvents is naturally dependent upon the nature of that deposit. In solvent cleaning of heat exchange surfaces the deposits for purposes of identification are first divided into one of three broad classes: (1) Inorganic deposits; (2) Organic deposits; (3) Mixtures of inorganic and organic deposits.

Inorganic Types: The inorganic deposits consist of a comparatively small number of specific chemical compounds, which may be designated by chemical or mineral name and by chemical formulae.[3] The possible constituent metals must be limited to those cations present in the water or fluid medium or formed from the metals with which the fluid medium comes in contract. The negative ions or anions will be those present in or derived from the fluid medium.

For example, if a well water is used as a cooling medium in a system consisting of steel pipe and a heat exchanger constructed with cast iron channel sections and copper alloy tubes and tube sheet, one may list the possible positive and negative ions to be expected:

[3] Numbers in parentheses refer to similarly numbered references in bibliography at end of paper.

Metal ions; Ca, Mg, Na; Negative radicals; $CO_3^=$ HCO_3^-, SO_4^-, Cl^-; From Water, Metal ions; K, Fe, Mn; Negative radicals; $S^=$, Oxygen OH^-, Silica; By corrosion attack on metal surfaces; Fe, Cu, Zn.

It would be possible to discover in the deposits such compounds as are insoluble in water under the conditions existing in the system: Carbonate or basic carbonate of —Ca, Mg, Fe, Mn, Cu, Zn; Sulfate of —Ca; Oxide or hydroxide of — Fe, Mn, Cu, Zn; Silicate of — Ca, Mg, Fe, Mn, Cu, Zn; Basic Chloride of — Cu; Sulfide of — Fe, Cu, Zn.

Further, if chemicals are being added to the system for corrosion control (phosphates, chromates, silicates, etc.) or for any purpose whatever, compounds containing these anions may be found in the deposits.

Organic types of Deposits: Organic materials may be found on water sides of tube and shell units under operating conditions where:

1. The water or steam are contaminated with oil or other organic matter.
2. Conditions are favorable for the growth of living organisms such as slime or algae.

However, typical organic type deposits are generally associated with the product sides of exchanger units in oil refineries, coke plants, chemical industries, etc.

Organic deposits generally consist of not one or two but hundreds and probably thousands of organic compounds. The effect of heat, pressure, moisture, and other physical chemical factors can produce a great variety of organic deposits. The organic deposit may be anything from a light volatile fluid, to a highly polymerized material or decomposed coke-like deposits which appear to be untouched by the solvents usually employed for solvent cleaning. Petroleum refineries, by-product coke plants, synthetic rubber plants, the fermentation industry, food processing industry, the chemical industry, and others have problems with organic deposits.

Because of the almost unlimited variety of organic deposits, identification for purposes of chemical cleaning may be generalized as follows:

(1) Of vegetable origin; Saponifiable; Non saponifiable. (2) Of petroleum origin; Soluble in carbon tetrachloride; Insoluable in carbon tetrachloride (3) Of coal origin; (Soluble in benzene or pyridine) and (Insoluble in benzene or pyridine); (4) Miscellaneous.

The above classifications for organic deposits are not entirely satisfactory. However, since no attempt can be made to classify these materials by their chemical identities, it becomes desirable to characterize them on the basis of some simple descriptive laboratory tests. The fundamental problem is to determine whether the deposit can be dissolved in a suitable organic solvent or dislodged and dispersed in an aqueous solvent sufficiently to effect its removal.

Mixtures of Organic and Inorganic Materials

It is not uncommon to find typical inorganic deposits in water and steam systems mixed with oil or grease, with living organisms such as slime, or various other materials which entered the system accidentally.

TABLE 2

TERMINAL TEMPERATURE DIFFERENCES OF TURBO-GENERATOR FEED WATER HEATERS BEFORE AND AFTER CHEMICAL CLEANING

	Unit 8		Unit 9		Unit 10		Unit 12	
	Before	After	Before	After	Before	After	Before	After
4th Stage Heater								
Actual Steam Temp. °F.	646.9	629.6	(not taken)	620.5	669.5	633.4	574.2	562.7
Avg. Steam Press, psi, abs.	209.9	200.0	221.2	214.1	219.9	221.5	152.1	148.7
Temp. Water leaving Htr. °F.	378.8	380.0	388.1	387.4	386.5	390.2	352.7	353.8
*Terminal Temp. Diff. °F.	∤ 7.0	∤ 1.8	∤ 2.2	∤ 0.1	∤ 3.0	∤ 0.2	∤ 6.9	∤ 4.0
8th Stage Heater								
Actual Steam Temp. °F.	504.3	486.7	(not taken)	471.3	513.5	499.7	394.2	371.4
Avg. Steam Press. psi, abs.	96.2	91.9	100.4	97.1	101.0	101.5	47.7	44.6
Temp. Water leaving Htr. °F.	311.4	316.8	318.3	324.2	313.0	324.2	269.7	267.4
*Terminal Temp. Diff. °F.	∤ 13.5	∤ 4.9	∤ 9.8	∤ 1.5	∤ 15.5	∤ 4.7	∤ 7.8	∤ 6.5
11th Stage Heater								
Actual Steam Temp. °F.	314.2	291.8	(not taken)	315.6	335.9	309.8	180.2	177.8
Avg. Steam Press. psi, abs.	39.3	36.0	40.2	38.1	40.8	39.4	7.9	7.7
Temp. Water leaving Htr. °F.	259.3	259.1	259.3	263.9	254.0	265.0	173.2	170.3
*Terminal Temp. Diff. °F.	∤ 6.9	∤ 1.8	∤ 8.3	∤ 1.1	∤ 14.5	∤ 1.3	∤ 9.1	∤ 10.8
14th Stage Heater								
Actual Steam Temp. °F.	183.6	182.5	(not taken)	184.4	201.8	186.3	(not taken)	
Avg. Steam Press. psi, abs.	8.8	8.2	8.4	8.2	9.2	9.1	" "	
Temp. Water leaving Htr. °F.	178.2	176.9	171.7	176.2	167.8	180.0	" "	
*Terminal Temp. Diff. °F.	∤ 9.0	∤ 7.0	∤ 13.4	∤ 7.8	∤ 21.4	∤ 8.9	" "	

*Based on the saturated steam temperature

On the other hand, most organic deposits contain some inorganic material resulting from corrosion of the metals in the system. For example, in a petroleum refinery most organic deposits are mixed with the sulfides of iron or copper.

Special chemical cleaning procedures may be necessary for satisfactorily dealing with these mixed deposits. This will be illustrated by a specific case history.

Types of Solvents

In solvent cleaning there are many solvents available. The number of practical solvents is limited, however, by cost, by fire and health hazards, and by the corrosive nature of the solvent. The type of solvent used in chemical cleaning is greatly influenced by the metals in the unit to be cleaned. This relation of the metals to solvents is illustrated in Table 1.

Chemistry of Chemical Cleaning

Inorganic deposits: In general, inorganic deposits are removed because the acid solvent reacts with the compounds in the deposit converting them to new compounds which are soluble in the aqueous solution. For example:

Carbonates

$$CaCO_3 + 2HCl = CaCl_2 + H_2O + CO_2$$

The CO_2 is evolved as a gas and the $CaCl_2$ is readily soluble in water. Other carbonates behave in the same way.

Oxides

$$Fe_2O_3 + 6HCl = 2FeCl_3 + 3H_2O$$

This reaction goes on more slowly than the one used in the first illustration. However, the product ferric chloride is soluble in the acid medium.

Certain oxides present special problems: Cuprous oxide, because it is not readily soluble in low concentrations of hydrochloric acid, and manganese dioxide because, if it does dissolve in hydrochloric acid, it causes the liberation of free chlorine which can create a serious corrosion hazard.

Sulfides

Iron sulfide dissolves readily but with evolution of hydrogen sulfide, a very poisonous gas, which must be handled with proper safety precautions in mind. Copper sulfides are not readily soluble. Zinc sulfide is intermediate in properties, it will dissolve readily under the proper conditions.

Calcium Sulfate

This compound, which is found much more often in boilers using raw water than in heat exchange equipment, is difficult to remove. For all practical purposes it is only slightly soluble in hydrochloric acid. One method of treatment which is effective in some cases is to use alternate alkaline and acid stages. Some calcium sulfate deposits respond to treatment with hot strong caustic solutions [7] but this method has not been widely used to date. The cost and danger of handling the solvent tend to discourage its use.

Silicates

The chemistry of the silicates is rather complex. It will serve our purpose here to indicate that there are two general methods of removing difficult deposits:

1. The use of hydrochloric acid containing addition agents which increase the solubility of the silicates.
2. The use of alternate alkaline and acid stages.

Usually laboratory tests and previous experience will guide the engineer in deciding which procedure to use.

There are some other miscellaneous substances which are encountered infrequently, but the ones above are of most general interest and will serve well to illustrate the problems involved. One other may be mentioned only because it presents an unusual corrosion problem. Calcium sulfite will dissolve in hydrochloric acid but when it does, it forms a strong reducing agent, sulfurous acid, which destroys many of the organic type inhibitors which are used in chemical cleaning. This may result in serious acid attack on the metal unit.

Organic Deposits: As suggested above, much of the task of removing organic materials involves physical changes rather than chemical reactions. Solution of the deposit in a suitable organic solvent or dispersion in adqueous medium are the most common methods.

The chemical reactions involved include: (a) Sap-

TABLE 3

DESIGN DATA ON HEATERS IN TABLE 2

	UNIT 8	UNITS 9 AND 10	UNIT 12
4th Stage Heater			
Manufacturer	Foster-Wheeler	Foster-Wheeler	Foster-Wheeler
Total area-sq.ft.	1340	1340	2830
Nominal overall heat transfer Btu/hr.	1924×10^6	20.65×10^6	59.03×10^6
Turbine throttle steam flow lb./hr.	280,000	280,000	570,500
8th Stage Heater			
Manufacturer	Foster-Wheeler	Foster-Wheeler	Foster-Wheeler
Total area - sq.ft.	1340	1340	2820
Nominal overall heat transfer - Btu/hr.	18.31×10^6	18.90×10^6	41.65×10^6
Turbine throttle steam flow - lb./hr.	280,000	280,000	570,500
11th Stage Heater			
Manufacturer	Foster-Wheeler	Foster-Wheeler	Foster-Wheeler
Total area-sq.ft.	1363	1363	2100
Nominal overall heat transfer Btu/hr.	21.36×10^6	22.80×10^6	44.58×10^6
Turbine throttle steam flow - lb./hr.	280,000	280,000	570,500
14th Stage Heater			
Manufacturer	Foster-Wheeler	Foster-Wheeler	--
Total area-sq.ft.	1025	1025	--
Nominal over all heat transfer-Btu/hr.	21.42×10^6	20.68×10^6	--
Turbine throttle steam flow - lb./hr.	280,000	280,000	--

TABLE IV

	Outside Temperature °F	Temperature of water to Heater, °F	Temperature of Water leaving Heater, °F	Steam pressure on shell side, p.s.i.
Heater #1				
January 15 ..	31	145	160	2.5
January 17 ...	Cleaned the unit			
January 20 ...	36	173	191	1.6
March 13	15	136	154	1.4
Heater #2				
January 15 ...	31	145	160	5.3
February 18 ..	Cleaned the unit			
March 4	5	146	176	1.3

onification by strong alkali; (b) Oxidation by alkaline or acid solutions containing strong oxidizing agents; (c) Reaction with concentrated sulfuric acid.

These few chemical generalizations are sufficient for this discussion.

Precautions

There are several other problems to be considered if chemical cleaning is to be done without danger to equipment and to personnel.

For the safety of both equipment and personnel, it must be recognized that explosions have occurred in a few instances where proper precautions have been wanting. Hydrochloric acid normally reacts with iron

$$Fe + 2HCl = FeCl_2 + H_2$$

Hydrogen is evolved. Substances known as inhibitors are used in the acid to inhibit or discourage this reaction but the best inhibitors cannot stop it completely. If the hydrogen which is evolved is allowed to become mixed with air in a confined space, a spark, a lighted match or cigarette, a flame tool, can ignite the mixture and a serious explosion may result. It is essential that hydrogen and other gaseous reaction products be conducted through proper vent lines away from confined spaces and from sources of ignition. "No Smoking" and "No Welding" signs should be posted where necessary.

Specifically for the protection of personnel it is important that those handling acids, alkalies, inhibitors, and other compounds used in chemical cleaning operations be properly instructed in methods of handling and be properly clothed with goggles, rubber suits, and rubber gloves when these are necessary.

Proper equipment should also include devices for detecting poisonous gases, which may be formed by chemical reaction between solvent and fouling deposit, and suitable gas masks or respirators, to be worn when needed.

Examples of hazardous gases are:

(1) Hydrogen sulfide is extremely poisonous and is frequently encountered in chemical cleaning work.

$$FeS + 2HCl = FeCl_2 + H_2S$$

(2) Carbon dioxide is evolved from all deposits containing calcium carbonate when inhibited acid is applied. It is not poisonous and is not normally considered dangerous. It can cause suffocation. The gas is much heavier than air and tends to settle into low places.

(3) Sulphur dioxide is formed from deposits containing sulfites. It is extremely disagreeable and severely irritating to respiratory organs.

For the protection of metal equipment there are some further considerations. It is not enough to know how each metal behaves in inhibited acid alone. One must also consider the possible effect of certain constituents in the deposit on the relation between solvent and metal. Oxidizing agents such as ferric iron compounds,[8] copper compounds, manganese dioxide, and chromates, tend to cause the corrosion rate to be higher than it would otherwise be. Special tests may be necessary to determine whether this effect will be serious. Reducing agents such as sulfites also have an adverse effect on many inhibitors. These facts must be properly anticipated and investigated if chemical cleaning is to be done safely.

Methods of Application

Chemical cleaning is generally performed by handling the solvent or solvents in tank trucks equipped with means of diluting concentrated aqueous solvents with water to the desired percentage concentration, of heating with live steam to the desired temperature, and pumping the solvent at the proper strength and temperature to the unit to be cleaned. This requires that steam and water lines be run to the truck location and a solvent line from the truck to the unit. Circulating the solvent during the reaction period may or may not be necessary or desirable. If it is, a return line from the unit to the pump truck becomes necessary. The need for proper venting has already been emphasized. A typical hookup is shown in Figure 1.

The proper reaction time between solvent and deposit is determined by chemical tests and by the experienced judgment of the chemical cleaning engineer. The solvent must then be disposed of, the unit flushed thoroughly with water and, following the use of acid solvents, a neutralizing wash applied.

If the solvent has dissolved most of the deposit and caused the remainder to sluff away from the metal surface so it can be washed out, the chemical cleaning would be considered successful. A nearly pure calcium carbonate or phosphate deposit will dissolve practically completely in a short time, but an iron oxide deposit, for example, dissolves slowly, while much of the deposit tends to sluff away. It would be impractical in most cases to continue the treatment to the point of dissolving 100 percent of the deposit. In general, then, it is necessary to anticipate the presence of sluffed material. In many cases normal flow of water through a heat exchanger will remove this sluffed material. In other instances it is necessary to provide some means of washing or scraping out this material. This is one of the most serious difficulties involved in removing certain deposits from the shell sides of tube and shell exchangers without dismantling the units. Fortunately, in most other types of equipment it is not a serious problem.

Case Histories

Power Plant: Turbine condensers: The degree of fouling which can be permitted before cleaning is necessary depends on the individual circumstances.[9] In a large utility generating station every tenth of an inch of vacuum lost because of fouling is important. In the power house of a small manufacturing company, generating part or all of its own power, the loss of vacuum may become several inches before the operator is seriously concerned.

Most generating station turbine condensers are chemically cleaned on the water side or steam side or both by filling with dilute hydrochloric acid, containing inhibitors and wetting agents, allowing to soak one to four hours

and flushing. The water side is easily flushed with regular circulating water. The gain in vacuum or drop in back pressure will probably be somewhere between 0.1 inch and 1.5 inches.

On the other hand a small condenser in a manufacturing plant may require two or more fillings of inhibited hydrochloric acid to restore several inches of lost vacuum. It would perhaps be better economy to have cleaned the condenser at more frequent intervals using correspondingly less solvent and time and having a much higher average efficiency of operation of the unit.

If a serious slime condition exists in the cooling water side of a turbine condenser in addition to scale deposits, it may be necessary to remove the slime by chlorine, copper sulfate, or hot alkaline pre-treatment and then use inhibited acid to remove the scale.

Feed water heaters: High pressure stage feed water heaters present a problem in chemical cleaning. Low pressure heaters are usually fouled with deposits containing copper and iron oxides. Dilute inhibited hydrochloric acid will generally remove them easily.

In high pressure stage heaters the same deposits are encountered, and have the same physical appearance. However, experience has shown that they cannot be removed with straight inhibited hydrochloric acid. The reason for this is that they generally contain decomposed oil in amounts of from approximately two percent to 30 percent. This oil even in the smaller quantities interferes with the solution of the deposits in acid.

An example is a Foster Wheeler 4 pass horizontal heater containing 760, 14 gauge Admiralty, 0.75 in. o.d. tubes 18 feet long with 2,690 sq. ft. of heating furnace. The unit was a fourth stage heater operating at approximately 400°F., deposits being a very thin scale containing copper oxide and hydrated iron oxide. Inhibited hydrochloric acid containing a surface tension lowering agent was added to the heater at 155°F. and slowly pumped through the unit expending the used solvent to the sewer. The unit on casual observation looked clean; however, later operating data indicated that it had not been cleaned to any appreciable extent.

The deposits were reanalyzed and an infrared analysis showed that there was approximately 2.2 percent oil present. Samples from a fourth stage heater in another unit operating under the same conditions were obtained. These had the same analysis, and an infrared analysis indicated that there was approximately 2.2 percent oil present. An oxidizing solution was pumped through the second heater and circulation was continued for one hour following which the solution was displaced to the sewer with water. Inhibited hydrochloric acid was then added. This time the heater was clean.

The same types of deposits in high pressure feed water heaters have been encountered in several power plants. Often times one stage of the oxidizing agent followed by an acid solvent is not sufficient. On some heaters as many as four stages of each type of solvent have been necessary.

Some interesting performance data on feed water heaters chemically cleaned are contained in Table 2.

Heating System: In an automobile plant the hot water for heating the plant and office building is supplied by using exhaust steam from the forges in Alberger Heaters. The heaters are vertical, two pass, tube and shell exchangers designed for a heat transfer of 60,000,000 B. T. U. per hour at 3 psi saturated steam pressure and a water flow of 4,000 g.p.m. The original copper tubes had been replaced by Admiralty metal tubes. It was estimated that this would reduce the normal heat transfer rate from 60,000,000 to 46,000,000 B.T.U. per hour.

Oil and grease from the forges had gotten past the oil separator and the shell side (steam side) of the heaters was fouled until grease stood 6-8 inches deep on the lower tube sheet. The tube side was fouled with a readily soluble water deposited scale.

The treatment consisted of using an organic solvent to remove the oil film from entire shell side, finally an inhibited acid solution to remove the water scale from the tube side. The acid solution was circulated through the unit first in one direction, then in the opposite direction. The whole operation was completed on each heater in six hours. Tubes later taken from the unit were thoroughly clean inside and out.

Performance data on both heaters are given in Table IV. Unfortunately data on rates of flow of water through the units are not available. Before cleaning it was necessary to operate both units continuously; since cleaning it has not been necessary to operate more than one heater at any time. Also the supply of steam from the boilers, which is used when the forges are not operating, has been materially reduced.

Salt Manufacture: Multiple effect evaporators are used in the salt industry to concentrate the salt brine. The chemical cleaning of these evaporators is well illustrated by experiences in a plant in Michigan. The deposits in the first effect are almost pure calcium sulfate. Those in the second effect are mixtures of calcium sulfate and calcium carbonate. The deposits in the third and fourth effects are almost pure calcium carbonate. Manual cleaning generally requires a crew of 8 to 12 men to clean one set of pans in approximately eight days. In chemical cleaning inhibited hydrochloric acid is added filling to slightly above the upper tube sheet. Where heat is required steam is vented into the solvent. Within 4 to 6 hours the third and fourth effects are free of scale, the second effect is almost clean, but the first effect still contains considerable calcium sulfate scale. The tubes in the first and second effect are then turbined in six hours with a two man crew. Salt production is increased several tons per day following the cleaning.

Cost Considerations

One consideration which has not been discussed and which is difficult to approach satisfactorily in a general way, is the question of the cost of chemical cleaning as compared to the cost of other methods of cleaning heat exchange equipment. Many factors enter into comparative costs which vary tremendously from one situation to another. The cost per unit depends on how many units can be cleaned simultaneously by the same crew of cleaning engineers, and the amount and type of scale present. Another factor of cost to the operator is the expense of preparing the unit for cleaning. Here chemical cleaning may offer considerable advantage by eliminating the need for building scaffolds, dismantling the unit, and so on. Still another very important consideration is the saving of time, if down time means the lowering of production schedules. In many instances this factor alone pays for the cost of chemical cleaning many times over. In other instances it does not represent a saving.

Cleaning Schedules

When heat exchange equipment is to be dismantled and manually cleaned it is natural to let it go as long as possible even though its inefficient operation is costing dollars every day of operation. If the unit is going to be dismantled and manually cleaned, the time and cost are about the same whether the unit has 1/64" of deposit on the metal surfaces or four times that much. So the job is put off as long as possible.

Suppose the deposit is a calcium carbonate scale accumulating at the rate of 1/64" every six months. The deposit will be 1/16" at the end of two years. If the unit is to be chemically cleaned, the amount of solvent required is directly proportional to the amount of scale so whether 1/64" is removed every six months during the two years of 4/64" at the end of the two years, the amount of solvent used would be approximately the same. But by applying one quarter of the solvent every six months, the over-all average efficiency of the unit is much greater than it would be if the deposit accumulates for two years. There are, to be sure, other costs for chemical cleaning than the cost of chemicals, but that is usually the largest single item.

With chemical cleaning programs, it is well to consider the advantages of cleaning at intervals such that the cleaning can be done quickly and easily, and the unit kept at high average operating efficiency. When units are allowed to become badly fouled, tubes may become plugged and spaces between the tubes become packed solid so solvent cannot get to the deposit. The cost of chemical cleaning may appear excessive and the results may be unsatisfactory. Then if the operator has to dismantle the unit and rod out plugged tubes and finish the cleaning job, he is quite likely to feel that someone has misrepresented the advantages of chemical cleaning.

Conclusion

It is hoped that this discussion has covered the primary applications of chemical cleaning to heat exchange equipment. This highly specialized field of chemical engineering is not a cure-all for the maintenance department's headaches, but with chemical cleaning engineers working in cooperation with maintenance men, operating engineers, water treatment engineers and those who design and install heat exchange equipment, many of the existing problems can be solved. It is not a field for patent medicine methods. Rather, it is a challenge to well trained and competent chemists, engineers and technical service personnel. In its proper applications it represents a new and better way of doing a very old job.

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Specialty Papers Manufactured by Pacific Mills Limited at Ocean Falls and Vancouver, B. C,

By R. H. R. YOUNG

Manager of Manufacture, Pacific Mills, Ltd., Vancouver, B. C.

With the summer meeting of the Technical Section of the Canadian Pulp & Paper Ass'n being held on the West Coast it was thought that some papers covering western operations would be fitting, and accordingly, I will endeavour to cover the manufacturing and converting operations of the majority of our so-called specailty grades as manufactured at Ocean Falls and converted in the Vancouver area.

We differentiate from newsprint in our organization by naming all wrapping grades, toilets, tissues, butcher grades, etc. as the specialty branch of Pacific Mills' operations.

As you know, the Ocean Falls mill is located some 325 miles north of Vancouver.

We manufacture upwards of 450 tons daily, including 280 tons of newsprint and 170 tons plus of specialty papers. It is interesting to note that the original conception of the Ocean Falls mill in the formative stages was a fine paper mill embracing the manufacture of soda pulp and coated papers. This program did not materialize.

Presented at the summer meeting of the Technical Section, Canadian Pulp and Paper Association, Vancouver, B.C., Sept. 8-10, 1948.

The present plant is composed of a sawmill or woodmill break-down plant, a 150-ton sulphate mill, a 250-ton groundwood mill, a 100-ton sulphite mill and a small two-stage bleach plant capable of bleaching 35 tons per day of sulphite. All groundwood pulp going to newsprint or specialty grades is treated with a zinc hydrosulphite bleaching agent which improves the general shade of our grades.

We have a conventional beater room with some 12 primary 2,000-lb. Jones beaters. These beaters are grouped for three specialty machines and have the continuous feature in their arrangement which provides for continuous feed and discharge along with continuous alum and colour additions. The beater room may be operated on continuous or batch system. Jones Majestic jordans are in use along with two Dilts hydrafiners which are connected to our No. 3 paper machine system.

We have two newsprint machines operating at 1,200 f.p.m. and three specialty paper machines which I will describe along with the grades manufactured on each machine. Our sixth machine is a combination pulp dryer and coarse grade machine.

No. 3 paper machine is a 168-in., Bagley & Sewall fourdrinier with a Beloit super-shake wet end, a suction couch, two rubber covered suction presses, a creping arrangement and conventional dry end system. The machine is equipped with a Sales secondary headbox and slice, which is used on .016 liner grades; one calender stack; a Pope reel, and conventional winder. This machine has a maximum speed of 785 f.p.m. and plans are under way to increase this speed to 1,200 f.p.m.

On this machine we manufacture kraft wrapping grades of paper which include 40-lb., 50-lb. and 60-lb. cement bag kraft, multiwall kraft, and creped kraft. Shopping bag papers of heavier weights are also manufactured on this machine along with building papers, heavy weight wrapping for veneer panels, doors, etc.

We manufacture .009 corrugating kraft for our corrugating operations and saturating paper for roofing base. The machine is equipped for calender colouring and also calender sizing on heavy weight grades. Steam showers and steam rolls are used on some of these grades. The machine also manufactures jumbo rolls, bag rolls and counter rolls.

Our No. 4 machine trims 114 in., and is a rebuilt machine with a Beloit super-shake wet end and Dominion Engineering dryers and drive. This machine is capable of running 1,000 f.p.m. and may be operated as a pick-up machine or a standard jacket and couch machine. The machine is equipped with a Dominion rubber-covered suction press, one plain press and a 4-ft. creping dryer. When running the pick-up arrangement the jacket couch is removed and a soft rubber roll is substituted, passing the pick-up felt through the fourdriiner nip, the suction press and also over the transfer dryer. The machine has two calender stacks, a drum reel and winder.

On this machine we run our finer grades of wrapping paper, tissues and toilet. As a rule we operate the machine with the pick-up arrangement on basis weights from 10- to 20-lb., operating with a standard couch arrangement on weights above that, although a large volume of our 25-lb., kraft is run with the pick-up arrangement.

On this machine we also manufacture well calendered and high finish grades of printing krafts in a large range of basis weights, waxing krafts for wet or dry waxing, natural and full bleached sulphite grades for printing and bag paper grades, sulphite butcher manila, kraft butcher manila, breadwrap grades, baker's manila, drawing manila, laminating krafts, lockerwrap, light weight kraft bags and cartridge manila. We manufacture gumming krafts in basis weights from 35 to 90 lb., and also sulphite gumming papers.

On the pick-up arrangement we manufacture toilets and tissues, high and low stretch creped kraft, domestic towel stock, full bleached towelling, full bleached napkin, manila toilet grades, dry and oiled fruitwrap and creped coloured box liner.

We are in a position to manufacture kraft or sulphite, either natural or bleached, or blends of these grades along with groundwood furnishes in making up our specialty grades of paper. This machine operates at speeds from 300-1,000 f.p.m., depending on the basis weight and the nature of the sheet being manufactured.

We endeavour to program our orders and forecast the requirements of our converting plant so that we enjoy approximately two months' running on this machine programmed as either a straight fourdrinier machine or a pick-up machine.

Our No. 5 machine is a 126-in., Yankee type. It is a rebuilt machine with a Beloti wet end, Dominion suction press equipment and a Beloit high pressure dryer. This machine was originally built by Bentley & Jackson Ltd., in England, and was practically rebuilt after a dryer exploded in the late 'twenties. This machine can be run as a pick-up machine or with a standard couch arrangement. It is equipped with two pressure rolls on a 12-ft., Yankee dryer with a marking roll attachment and is capable of operating at speeds up to 900 f.p.m.

This machine manufactures light weight tissues of 10-lb., and up to a maximum basis weight of approximately 55-lb., in heavy weight kraft grades or groundwood, sulphite furnishes. 11-lb. and 12-lb. tissue grades are manufactured on it from sulphite pulp. Full bleached and semi-bleached tissues, striped natural sulphite bag and many grades of kraft and sulphite for printing, as well as a few kraft waxing grades are also manufactured on this machine.

Large tonnages of medium weight grades of striped kraft bag as well as the same grade in a plain surface are manufactured on No. 5 machine. Laminating kraft is manufactured extensively on this machine. Manila envelope paper with groundwood sulphite furnish is also manufactured in a range of weights.

Our remaining machine—No. 6—is a 115-in. Black-Clawson Fourdrinier and is used as a pulp dryer in addition to making millwrap, core paper, and .021 and .031 chipboard for the manufacture of solid fibre carton blanks. This machine is equipped with three standard presses and a combination of vertical and horizontal dryer sections. It has a single calender stack which is equipped for calender coloring.

This, briefly, covers the paper specialties manufactured at the Ocean Falls plant.

A word at this time might be said generally regarding the furnish supplied to the grades mentioned.

In corrugating kraft we use an average of 50 percent virgin kraft in our .009 grade with the balance of the furnish made up of a blend of refined kraft, and sulphite and groundwood screenings which are accumulated in storage pits for chipboard and corrugating runs.

All kraft grades are manufactured from 100 percent

virgin kraft pulp using wood species of spruce, hemlock and some cedar along with a small percentage of fir.

Sulphite grades, bleached or unbleached, are manufactured from spruce, hemlock or balsam pulp. Many combinations of toilet tissue grades include some groundwood from the news system. Towelling grades are combinations of groundwood and sulphite, bleached or unbleached.

The finishing room is equipped to manufacture flat sheet or roll orders. We have three Hamblet cutters and a Seybold guillotine. Two of the Hamblet cutters have duplex knives and one is equipped with a quire folder attachment.

We have one 84-in., Cameron high-speed winder for paper salvage and some counter roll manufacture and a conventional news rewinder along with one small 60-in., Cameron rewinder.

So much for the manufacture of the base stock at Ocean Falls. This paper is shipped to Vancouver in covered barges palletized in as large jumbos as the individual converting operation will accommodate.

Our converting operations in this city include the Vancouver converting plant, which is located on Burrard Inlet at the foot of Campbell avenue, and Canadian Boxes Ltd., located at 281-285 Industrial street, close to the Canadian National Railways station on Main street.

Our specialty grades of paper are primarily for the domestic market. Our converting plant was originally located at Ocean Falls, but the volume of business expanded to such a point that it was necessary to move it to Vancouver. In this plant we carry on a variety of converting operations and the scope of this operation is quite remarkable. All of the paper converted here is manufactured at Ocean Falls.

We do a variety of printing with both aniline and oil inks. The plant contains one aniline two-colour press of 48-in., which has been rebuilt at our plant and is used primarily in the printing of breadwrap, heavy kraft wrapping and printed kraft grades. We have an Austill four-colour press, 42 in., in width, which is used in the printing of breadwrap and label stock, using oil and vapour-set inks. We have a three-colour Kidder press 52 in. in width, using oil inks for breadwrap stock and specialty printing. There is also a two-colour Bojanower gummed tape press used to print both sulphite and kraft gummed tape.

The plant is equipped with two waxers, one unit for wet waxing with a Shartle water finisher and the second unit for wet and dry waxing grades.

Two Axelson presses, 36-in., and 40-in., respectively print fruitwrap and tissue grades.

The plant contains three Cameron rewinders used in the slitting of gummed tape, rewinding of breadwrap rolls and other comparable rewind duties.

We have one 84-in., Seybold cuter which is used in our sheet business. There is also a 43-in., Beck sheet cutter equipped with an electric eye for use in cutting label paper, breadwrap grades, etc., where sheet cutting to pattern is necessary.

Creped filter papers, waxed creped kraft for carcass covers, as well as any two-process creped paper which may be manufactured, are converted on a 70-in., creper.

We have a 36-in., gummer which gums both kraft and sulphite in basis weights from 35- to 90-lb.

A 20-roll 72-in., conventional Hamblet cutter converts all of the sheet business in our affairs.

We have six bag machines of Potdevin design and are able to manufacture from quarter-lb., to 35-lb., bags.

In our tissue department we have the last word in napkin machines, made by Paper Converting Machine Co. This unit manufactures 10 in x 13½ in. dispenser napkins at 100,000 napkins an hour. We also have a second napkin machine, made by that company, which is capable of converting both the dispenser napkin and the quarterfold 13½ in. x 13½ in. napkin. The equipment also includes a toilet rewinder equipped with an embosser and a second rewinder, capable of converting plain toilet rolls as well as lunch rolls and economy towels. The plant has one towel folder machine, folding a 14-in. domestic interfold towel. Equipment for sewing carcass covers and other hand-made bags is also included.

In giving you a brief summary of the equipment we have in our plant I have endeavoured to outline the products we manufacture on it. A multitude of specialty orders is also programmed through this equipment, such as ice cream pail liners, creped kraft in odd shapes, and forms for turkey and chicken wrapping. Solid fibre board is processed into cherry lug separators for the fruit packing industry and creped krafts are converted into pear pads, apple pads, etc. The printing and gumming of label paper for our own use as well as for the lumber business has developed into a sizable volume of business. Perforated gummed tape in the plywood business is a substantial specialty. Gummed tape processed with a tear strip through the centre of the tape has grown into a business of considerable size. All of these products are converted on machines which for the most part have been developed in our own plant and designed by our own engineers.

Substantial tonnages of waxed paper in light and heavier weight grades are converted into household sizes. Special waxing of papers for lockerwrap, food processing—both printed and plain—totals a fair volume.

So much for our specialty converting operations.

We will now consider briefly the operations which we carry on at Canadian Boxes, Ltd., a subsidiary of Pacific Mills, Ltd.

As mentioned earlier in this paper, this plant is physically removed from the converting plant and is located in another section of the Vancouver industrial area.

In this plant we have approximately 170 employes and manufacture corrugated container board and solid fibre container board, carrying on the complete conversion of both these basic stocks to the ultimate box, printed and stitched for delivery.

Following the operational sequence at our box plant, it is equipped with a 68-in., corrugator capable of manufacturing A- and B-flute single-wall corrugating board and also the combination of A- and B-flute double-wall corrugating board. The machine is of conventional design. We recently installed Hooper roll stands, used in the unreeling stands of this machine. These stands are shaftless and make it very simple to change rolls without the hazard or work of handling heavy shafts. The machine is equipped with the conventional double backer. Our adhesive at this time is starch furnished by the Stein-Hall Co., through the Bauer patents. The corrugator is equipped with a Hooper duplex knife cutter.

This plant is rather outstanding in that all of the box

blanks travel on driven or gravity roller conveyors with a system of transfer switches which practically eliminates the use of skids and pump trucks in the operation.

We have a Hooper two-color printer slotter machine and one longway two-color press. The plant has a Cottrell die press for specialty boxes such as chick boxes and poultry containers, and a conventional rotary slotter which is used for odd orders. There are six stitchers, four automatic and two semi-automatic.

We have recently installed one Bowee folder which folds the boxes automatically. There is also a conventional box taper in the plant.

All paper coming to the plant and boxes leaving the plant are loaded on pallet boards which results in a considerable labour savings.

In the solid fibre operation we have a standard laminating machine 70-in., in width which manufactures up to 6-ply solid fibre board. The machine is equipped with six back stands and uses silica as an adhesive. It has a duplex knife.

We have a two-colour Hooper box press which prints all solid fibre blanks as well as two creasers and a hand Knowlton slotter.

We manufacture all calipers of solid fibre from 40-caliper to 100-caliper board. The Canadian Box plant supplies corrugated and solid fibre board to industries requiring cartons on the West Coast, along with some business in the Prairie Provinces.

At the Vancouver converting plant we manufacture paper bags, printed heavy weight sheets and sleeves and gummed tape for the packaging industry, lumber industry, plywood industry, etc.; at Canadian Boxes, Ltd., we are manufacturing corrugated or solid fibre cartons to do, in many instances, the same work. We find occasionally we are in open competition within our own organization to develop the best type of package for the customer, whether it be a pasted solid vbre or corrugated carton, or cut sheets or rolls with gummed tape. We feel we are able to serve West Coast industry with a variety of packaging methods and techniques.

I have attempted in this paper to roughly review the specialty grades of paper as manufactured by Pacific Mills at Ocean Falls and to briefly present to you their conversion and end use within this geographical area. My paper may appear to be somewhat of a machine catalogue along with grades as manufactured, but I felt that to adequately summarize our operations for you it was necesary to outline the equipment and machines we have and the end use of our products which are being manufactured on this equipment.

Rail Shipment

(Continued from page 13)

Papers, artist's board, have in the past had to be shipped under the general term Artists' Materials, the rating high, as follows: less-than-carload, Class 1 (100 percent) and; carload, Class 3 (70 percent) and these rates applied anywhere in the country, unless changed by various carriers' exceptions which on this type of material is very unlikely. On December 30, the item will be listed on a lower rating of less-than-carload Class 2 (85 percent of the first class rate) and carload with a minimum weight of 30,000 pounds, Class R26 (55 percent) in the East; Class 4 (55 percent) in the South and West.

Paper, wallboard, now required to be shipped in boxes and crates, on December 30 will also be allowed to be shipped by rail in packages. If the latter are used, all edges must be protected by wood strips. The wrapping to be in fibreboard and test not less than 200 pounds. The protection has to extend on back not less than four inches and package must be strapped with not less than three metal straps. The ratings are on less-than-carload, third class (70 percent); carload, minimum weight 30,000 pounds, Class 45 (45 percent of the first class rate) in the East; Class 5 (45 percent in the South; Class A (45 percent) in the West.

There is now in effect a new low rating by rail, carload minimum weight 30,000 pounds, on *paper, lining* or *carpet paper,* on shipments from points East of the Mississippi River to Canada. The former rating was Sixth Class (27½ percent of the first class rate), the rating now is 90 percent of the sixth class rate (24.8 percent). This is lower than the East and South, these have Class 25 (25 percent).

An item reported in the October 21 issue of *Paper Trade Journal* has a change coming December 30. *Paper carriers* for ice cream cones or drinking cups, present ratings carloads (36,000), in the East and South (35 percent—classes 5 and 7), the West (37½ percent), both weight and rating will decrease in the South to 30,000 pounds and 27½ percent of the first class rate.

PPTA Dinner, Jan. 12

(Continued from page 15)

The annual meeting of the entire membership, which consists of the Fine and Wrapping Paper Divisions, will be held this year at noon on the same day, for the election of officers for the ensuing year.

Present officers are: Frederic S. Balch, president; T. H. Butler Smythe, vice-president, Fine Paper Group; Henry L. Adler, vice-president, Wrapping Paper Group; Charles A. Wilder, treasurer; Allen M. Russell, secretary; and David S. Stockslager, executive secretary.

Stewart Awarded Contract

WINDSOR MILLS, Que. — The R. E. Stewart Construction Corp., Sherbrooke, Que., has been awarded the contract for construction of the superstructure of the digester and washer building for the Canada Paper Co., here, at $105,000, exclusive of the structural steel which is supplied by the MacKinnon Structural Steel Co., Ltd., of Sherbrooke.

Foundations are already in and were built under three separate contracts by the Stewart firm. Plans are by J. Charles Day, consulting engineer, Montreal, with A. Leslie Perry, Montreal, architect.

More Machinery Available

OTTAWA—Pulp and paper machinery is now in fair supply in Canada, with a wide range of pulp-making machinery but a limited range of paper-making machinery, according to the Export Division, Foreign Trade Service of the Canadian Government here. Deliveries range from nine to 20 months depending on the type of equipment. Small pulp-making items may be obtained in Canada from three to nine monts, the report adds.

Quarter Century Club

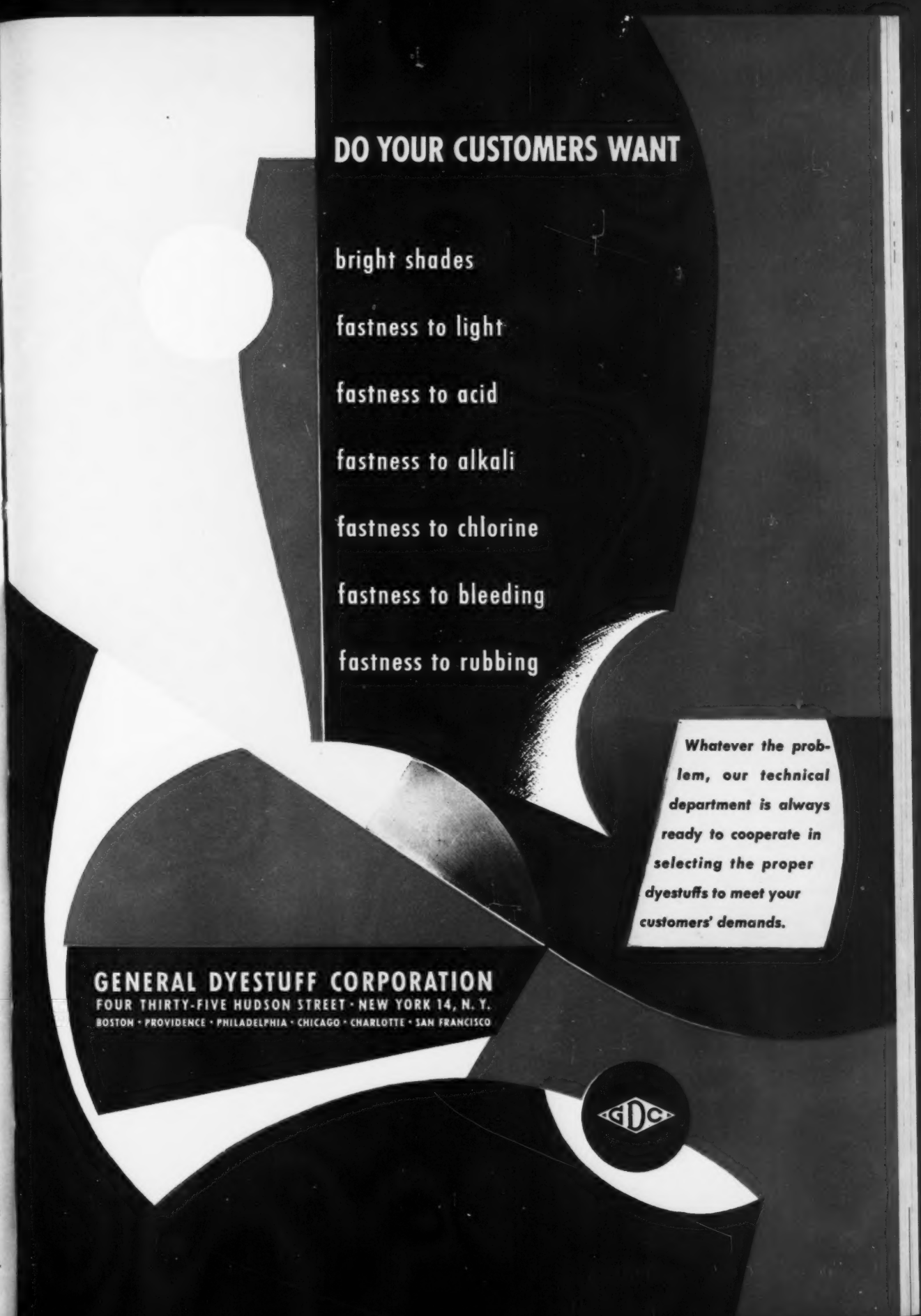
CLEVELAND — Six Lindsay Wire Weaving Co. employes were admitted to the firm's Quarter Century Club on December 4, and watches were presented by A. Fred Crossman, president, to them in recognition of 25 years' service at Lindsay.

Opens Atlanta Office

ATLANTA — Stein, Hall & Co., Inc., New York City, has opened a sales office at 364 Nelson street, S.W., in charge of E. D. Estes, who served the organization in this same territory from the Stein, Hall, Charlotte, N. C., office.

Baxter to Coast for IPI

LOS ANGELES — Paul N. Baxter has been named manager of the Los Angeles Branch of the International Printing Ink Corp., Ltd., of California. He comes to his new post from the IPI Chicago office.


DO YOUR CUSTOMERS WANT
bright shades
fastness to light
fastness to acid
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Whatever the problem, our technical department is always ready to cooperate in selecting the proper dyestuffs to meet your customers' demands.
GENERAL DYESTUFF CORPORATION
FOUR THIRTY-FIVE HUDSON STREET · NEW YORK 14, N. Y.
BOSTON · PROVIDENCE · PHILADELPHIA · CHICAGO · CHARLOTTE · SAN FRANCISCO
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Trends

Office of the PAPER TRADE JOURNAL,
Wednesday, December 15, 1948.

Newsprint

Contained within the Newsprint Service Bureau's reply to the Senate Capehart Subcommittee's questionnaire on zone pricing are some market facts concerning U.S. production and the world shortage. Newsprint paper is the only important kind of paper made in the U.S. that does not have tariff protection. Since being placed on the free list in 1913, it has been bought by U.S. users in a highly competitive world market. And with U.S. manufacturers now furnishing only one-seventh of the newsprint used, there is little they can do to affect that market; they must meet world competition to survive. "Due to competition from Finland, Scandinavia, Nova Scotia, New Brunswick, Quebec, Ontario and Newfoundland, many mills which formerly made newsprint paper in the U.S. have been forced to quit its production and turn to more profitable grades," says the report. Those companies unable to make the shift were forced to liquidate. U.S. production for 1948 will not be greater than one-half the tonnage made in 1926 when 40 U.S. companies were producing newsprint, compared with eight companies now making considerable quantities and few others negligible proportions of the total output. Of the 826,000 tons made in the U.S. in 1947, 53,419 tons were produced in Texas, 490,642 in Maine, 119,943 in Oregon, and 153,183 in Washington.

Southern Supply

The Lufkin, Texas, mill is now producing some 100,000 tons annually. Coosa River, now under construction and scheduled for 1950 production, also will yield 100,000 tons annually — of the highest quality newsprint ever produced in the south — states Mr. A. G. Wakeman, executive vice-president of Coosa River Newsprint Company. Mr. Wakeman expressed belief that newsprint manufacture will be one of the South's greatest assets.

Editor Roddy of the *Dallas Morning News*, following a survey of the newsprint supply, asserted that newsprint supply for southern newspapers will grow tighter in the years to come unless unforeseen forces unravel the gray-market tangle of production, demand and supply. By 1958, it is possible that Lufkin and Coosa River may aggregate 280,000 tons annually, yet hardly a drop in the bucket of requirements for Southern newspapers at the expanding per capita newsprint demand. The South used 450,000 tons in 1941, 600,000 tons in 1947, and is heading for 750,000 this year, with the saturation point not in sight. Many newspapers have had to rely on gray-market newsprint at $155 to $210 f.o.b. New York, against the New York contract price of $100 a ton, even while their advertising and circulation price structures are keyed to regular market newsprint prices. Gray-market prices upset that balance which unless adjusted will cause southern newspapers to fold up.

Most of the Southern supply comes from Canada, to which the South now looks for the solution of the price problem and stabilization of newsprint supply. Mr. Roddy states that he believes the desirable solution is for more mills to locate in the south where a vast source of raw material can be made available.

Spot Newsprint

Large tonnages of spot newsprint for 1949 delivery are being offered, especially from overseas mills which do not have authorized distributors in the U.S., the ANPA advises. Prices quoted by brokers are not uniform and are subject to negotiation, but offerings at $140 per ton on dock Atlantic coast ports are reported.

New Supply

Several hundred tons of standard newsprint are being made in a Canadian mill heretofore engaged entirely in the manufacture of fine papers, the ANPA also reports. Price is somewhat higher than the New York contract price of $100 a ton.

British Shortage

Britain's newsprint shortage was highlighted again at the annual London meeting of the Bribery and Secret Commission Prevention League when its president, the Marquess of Carisbroke, complained that the present lack of space prevents his group from publicizing information about misdeeds of public officials. "The serious, immediate need is for more and bigger papers, books and periodicals," he said, "if we are to avoid compositors and readers cramp, and worse—democratic anemia." He added that the Government is "creating a hybrid state, half fettered, half free" through its refusal to allow imports of sufficient newsprint.

British newsprint consumption will at the beginning of the new year revert to the position existing before the cut effective in 1947's summer, it was announced recently by President Harold Wilson of the Board of Trade. The change—the result of a substantial increase in home production—will enable national dailies to revert to five pages, with appropriate increases in other newspapers. Also it will permit newspapers to print sufficient copies to meet the public demand.

Australia's Supply

Canberra news item reports Prime Minister Chifley's announcement that newsprint rationing in Australia will end January 1. Import licensing regu-

(Continued on page 74)

FINLAND

DELIVERS HER

WOOD

PULP

MONTHLY

THROUGHOUT

THE YEAR

(NO CLOSED NAVIGATION)

PULP SALES

CORPORATION

230 Park Ave.

New York 17, N. Y.

Telephone: MUrray Hill 5-8764

Imports

Week Ending Dec. 11

NEW YORK

Newsprint

Madden Reeve Angel & Co., Mormacdawn, Helsingfors, 111 rolls.
Madden Reeve Angel & Co., Mormacpenn, Helsingfors, 366 rolls.
Madden Reeve Angel & Co., Siljan, Kotka, 709 rolls.

Press Paper

Walker Goulard Plehn Co., Parthia, Liverpool, 6 cs. (glazed).

Sulphite Paper

Greenwich Paper Products Inc., Stockholm, Gothenburg, 163 rolls.

Filter Paper

E. H. Sargent Co., Stockholm, Gothenburg, 5 cs.

Cigarette Paper

Globe Shipping Co., American Scout, Havre, 2 cs.

Wallpaper

C. A. Haynes & Co., American Packer, Manchester, 182 ctns.

Gummed Paper

B. F. Drakenfeld & Co., American Packer, Liverpool, 54 cs.

Tissue Paper

B. F. Drakenfeld & Co., American Packer, Liverpool, 6 cs. (pottery).

Wrapping Paper

J. P. Heffernan Paper Co., Scott E. Land, Genoa, 10 bls.
Chemical Bank Trust Co., Mormacpenn, Gothenburg, 90 rolls.

Serviettes

A. C. O. Leather Co., American Scout, Hamburg, 25 bls.

Printing Paper

Olympic Shipping Co., American Planter, Havre, 5 cs.

Rags, Baggings, Etc.

Loumar Textile By-Products Inc., Selma Thorden, Gothenburg, 89 bls. old waste bagging.
Williamson Northrup Co., Mormaccowl, Santos, 67 bls. cotton waste.
Ayres W. C. Jones Co., Ronda, Havre, 52 bls. cotton waste.
A. de Vries Trading Co., Ronda, Havre, 49 bls. scrap bagging.
Williamson Northrup Co., Mormacwren, Paranagua, 170 bls. cotton waste.
R. Blank, Exporter, Port Said, 65 bls. white cotton rags.
New England Waste Co., Jalakanya, Tuticorin, 248 bls. cotton waste.
(———), Marwarri, Calcutta, 15 b's. old jute rags.
W. F. Malcolm & Co., City of Lille, Calcutta, 100 bls. old jute cuttings.
(———), American Packer, Manchester, 89 bls. cotton gabardine cuttings.
(———), City of Swansea, Calcutta, 31 bls. cuttings.
L. Gottlieb, Bastogne, Antwerp, 88 bls. rags.
A. W. Fenton Inc., John B. Waterman, Rotterdam, 43 bls. scrap bagging.
E. J. Keller Co., Inc., John B. Waterman, Rotterdam, 60 bls. old bagging.
A. de Vries Trading Co., American Planter, Havre, 114 bls. scrap bagging.
E. J. Keller Co., Inc., Scott E. Land, Bombay, 200 bls. old jute rags, 200 bls. cotton waste.
Camden Fiber Mills, Scott E. Land, Bombay, 100 bls. cotton waste.
Brandwein Mazur Co., Scott E. Land, Bombay, 100 b's. cotton waste.
Biffalo Batt & Felt Corp., Scott E. Land, Bombay, 107 bls. cotton waste.
Manufacturers Trust Co., Scott E. Land, Bombay, 100 bls. cotton waste.
Schimmel Trading Corp., Scott E. Land, Port Said, 22 bls. scrap bagging.
Chemical Bank Trust Co., Scott E. Land, Genoa, 279 bls. hemp rags.
Tradelines International Corp., City of Leeds, Calcutta, 111 bls. jute rags.
Midwest Waste Material Co., City of Leeds, Calcutta, 19 bls. old jute rags.
Connecticut Burlap & Waste Co., City of Leeds, Calcutta, 11 bls. old jute rags.
(———), City of Leeds, Calcutta, 70 bls. old jute rags.
Irving Trust Co., Executor, Leghorn, 73 bls. scrap bagging.
J. Eisenberg, American Traveler, Liverpool, 14 bls. wool rags.
Loumar Textile By Products, Exbrook, Venice, 99 bls. rags.
(———), Exbrook, Venice, 29 bls. cotton tares.

Old Rope, Etc.

(———), American Traveler, Glasgow, 47 coils, 25 bls. old rope.
(———), Explorer, Bombay, 374 bls. old hemp rope cuttings.
(———), Jalakanya, Calcutta, 60 bls. old hemp rope cuttings.
(———), Marwarri, Calcutta, 495 bls. old hemp rope cuttings.
(———), City of Swansea, Calcutta, 125 bls. old hemp rope cuttings.
Chemical Bank Trust Co., City of Swansea, Calcutta, 120 bls. old hemp rope cuttings.

Gluestock

Darmstadt Scott & Courtney, Agwimonte, Vera Cruz, 125 bls.

Casein

T. J. Kane, Herdis, Buenos Aires, 1000 bags (lactic).

China Clay

English China Clay Sales Corp., Montreal City, Avonmouth, 400 bags.

Woodpulp Boards

National City Bank, Siljan, Kotka, 384 pkgs.
Jay Madden Corp., Mormacpenn, Helsingfors, 537 bls. (solid white).
Jay Madden Corp., Mormacdawn, Helsingfors, 125 bls., 363 rolls.

NEWARK

Perkins Goodwin & Co., Selma Thorden, Utansjo, 3000 bls. dry sulphite pulp.

PHILADELPHIA

National City Bank, Mormacdawn, Helsingfors, 254 bls. mechanically ground woodpulp.
Madden Reeve Angel & Co., Mormacdawn, Helsingfors, 960 rolls newsprint.
Elof Hansson, Inc., Selma Thorden, Hernosand, 6000 bls. dry sulphite pulp.
D. Galloway, Selma Thorden, Gothenburg, 27 bls. jute waste.
E. J. Keller Co., Inc., Elizabeth, Antwerp, 193 bls. jute waste.
Mynol Chemical Co., American Packer, Liverpool, 2 crates carbon paper.
Pulp Sales Corp., Mormacpenn, Helsingfors, 2286 bls. white dry mechanically ground woodpulp.
(———), Executor, Leghorn, 99 bls. cotton rags.

BALTIMORE

A. de Vries Trading Co., Ronda, Antwerp, 62 bls. scrap bagging.
W. F. Malcolm & Co., City of Swansea, Calcutta, 77 bls. old jute cuttings.
Madden Reeve Angel & Co., Siljan, Kotka, 1039 rolls newsprint.
Jay Madden Corp., Mormacpenn, Helsingfors, 167 rolls wrapping paper.
Madden Reeve Angel & Co., Mormacpenn, Helsingfors, 72 rolls newsprint.

NORFOLK

E. Butterworth & Co., Inc., American Packer, Manchester, 163 bls. old bagging.
F. P. Gaskell & Co., American Clipper, Glasgow, 44 cs. coated paper (for cigarette tipping).
F. P. Gaskell & Co., American Traveler, Glasgow, 35 cs. coated paper (for cigarette tipping).

LOS ANGELES

Castle & Overton, Inc., Scott E. Land, Bombay, 120 bls. old jute rags.
Pacific Brokerage Co., Scott E. Land, Bombay, 100 bls. wrapping paper.
National City Bank, Marine Snapper, Genoa, 158 bls. old waste bagging.

Gale, Kidd, Advanced

ST. JOHN, N. B.—G. Gordon Gale of the E. B. Eddy Co. has been named vice-chairman of the board, and W. S. Kidd, president and managing-director of the company.

Doscher Heads Club

NEW YORK—Fen Doscher, vice-president of the Lily-Tulip Cup Co. has succeeded Gene Thomas as head of the Sales Executive Club of New York.

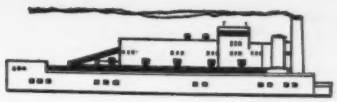
Huxley In New Home

NEW YORK—The Huxley Envelope & Paper Corp. has moved into larger offices, showroom and stockroom at 295 Lafayette street.

Sandy Hill-Canadian Vickers Deal

TORONTO—Canadian Vickers, Ltd., primarily a ship-building concern, has entered into an agreement with the Sandy Hill Brass & Iron Works, Hudson Falls, N. Y., to manufacture pulp and paper machinery in Canada, T. R. McLagen, vice-president and general manager of the Vickers organization discloses. Under the arrangement Canadian Vickers would have access to the patents, designs and engineering experience of the Sandy Hill company.

Mr. McLagan points out that his company policy in general has a two-point aim: (a) greater diversification in production (b) increase in U. S. dollar earnings. As an example of the diversification policy, Mr. McLagan pointed to the large industrial alcohol plant which Vickers-Vulcan Process Engineering Co., a partly owned subsidiary, has just completed at Gatineau, Que. This plant, one of the largest of its kind, manufactures industrial alcohol from sulphite waste liquor. Mr. McLagan stated that the Vickers-Vulcan Co. is steadily adding to its sales.



process "know how" + unit operations = profitable pulp mill processing

Foster Wheeler designs and constructs special apparatus for pulp mills. Pulp mill processing makes use of one or more of the following basic engineering unit operations with which FW engineers have had unusual success over the years in numerous industrial applications:

Heating
Cooling
Condensing
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Evaporation

Turpentine Recovery
Indirect Digest Heating
Digest Blow Heat Recovery
Tall Oil Processing

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FOSTER WHEELER

Prices

Quotations indicate trends in an open market. At the moment they can be of little more value. While some volume business still is done under contract at the figures shown, fluctuations are too varied and frequent to permit prices to be interpreted as representing a wholly stabilized market.

NEW YORK

Paper

(Delivered New York)

Standard News, per ton—
Rolls, contract ..... $100.00/ —
Sheets ..... 115.00/ —

Kraft—per cwt.—Carload Quantities Zone A Deld. 40 lb. base wgt.
Superstandard Wrapping ..... $9.00/ —
No. 1 Wrapping 7.75/ 8.00
Standard Wrapping Rolls ..... 7.00/ —
Standard Wrapping Sheets ..... 7.50/ —
Standard Bag ..... 6.50/ —

Tissues—Per Ream 24x36 (480) 10/11 lbs. Zone 1.
Wh. No. 1 Frd. ..... $1.84/$2.00
Wh. No. 1 M. G. 1.94/ 2.00
Wh. No. 1½ ..... 1.65/ —
Wh. No. 2 ..... 1.50/ 1.70
Kraft Anti-Tar ..... 1.65/ —
Kraft Unbl. ..... 1.85/ —
Shred. Wh. No. 1 per lb. ..... .12¾/ .18

Toilet—Per Case of 100 rolls—1 M Sheets.
Unbleached ..... $7.50/$10.00
Bleached 8.75/ 10.00

Paper Towels—Per Case of 3750—Zone 1.
Wh. Jr. M'tif'd 9¼x9½ $5.45
Br. Sr. M'tif'd 10x12 ..... 3.80
Br. Jr. M'tif'd 9½x9¾ 3.30
Br. Jr. Sgl. fold 10x10¾ 3.35

Manila—per cwt.—C-1 f.a.
No. 1 Jute Tag ..... $14.50/ —
Reg. Jute Manila ..... 13.25/$15.50
No. 1 Manila Wrapping 8.75/ 10.50
5 lb. Manila 10.75/ 11.25

Boards, per ton—
Filled News 94.00/
Plain Chip 85.00/ 90.00
Blchd. Mla. L-d. Chip* 105.00/
White Pat. coated* 120.00/
Kraft Liners 42 lb. 105.00/
Kraft Corr. .009 ..... 110.00/
Binders Boards 120.00/126.00
* Base Prices per 10 tons. Less than 10 tons but over 3 tons, add $2.50; three tons or less, add $5; regular 35-39 basis, add $5; basis 40-49, add $2.50; basis 91-100, add $2.50; basis 101-120, add $5.

The following prices are representative of distributors' resale prices, all deliveries in Zone 1:

Rag Content Bonds and Ledgers—
White, 16 lb.
Bonds, per cwt.

	Carton	4 C't'n	Ton
100% Rag Ext. No. 1	$59.00	$54.55	$52.30
100% Rag	52.25	48.30	46.30
75% Rag	41.50	38.30	36.70
50% Rag	33.75	30.70	29.50
25% Rag	30.25	27.45	26.35

Ledgers, per cwt.

100% Rag Ext. No. 1	$57.00	$52.65	$50.50
100% Rag	50.25	46.40	44.50
75% Rag	41.50	38.30	36.70
50% Rag	33.75	30.70	29.50
25% Rag	30.25	27.45	26.35

Sulphite Bonds and Ledgers—
White, 16 lbs.
Bonds, per cwt.

No. 1	$21.25	$19.25	$18.50
No. 2	20.25	18.30	17.55
No. 4	19.25	17.55	16.85

Ledgers, per cwt.

No. 1	$21.75	$19.65	$18.85
No. 2	20.75	18.75	18.05
No. 4	20.00	18.10	17.35

White Book, per cwt.—

Coated	Case	Ton
No. 1 Glossy	$20.90	$20.15
No. 2 Glossy	19.65	18.90
No. 3 Glossy	18.90	18.25
Machine Coated	16.65 to 17.15	16.05 to 16.35
Uncoated		
No. 1 Antique (Watermarked)	16.40	15.80
Offset	15.15 to 17.15	14.60 to 16.40
A Grade E. F.	15.40	14.85
A Grade S. C.	15.90	15.35
B Grade E. F.	15.15	14.55
B Grade S. C.	15.65	14.95

New Domestic Cotton Cuttings

(Prices to Mill, F.o.b. Ship. Pt.)

White Shirt	$10.00/	$10.50
Unbleached Muslin	10.50/	11.00
Light Silesias	7.75/	8.00
White Back Blue Overalls	6.25/	6.75
Blue Overalls	6.00/	6.50
Fancy Shirt	5.00/	5.50
Percales	6.25/	6.50
Light Prints	6.50/	6.75
No. 1 Washables	4.00/	4.50
Bleachable Khaki	5.50/	5.75
Unbleachable Khaki	5.00/	5.50
Cottonades	4.75/	5.25
Lt. Flannelettes	7.50/	8.00
Men's Corduroy	4.25/	4.50
Women's Corduroy	4.00/	4.25

Old Domestic Cotton Rags

(Prices to Mill, F.o.b. Ship. Pt.)

	Per 100 lbs.	
No. 1 Whites, Repacked	$5.00/	$5.50
No. 1 Whites, Miscellaneous	4.00/	4.50
No. 2 Whites, Repacked	3.00/	3.50
No. 2 Whites, Miscellaneous	2.50/	2.75
Blue Overalls	3.50/	4.00
Thirds and Blues Repacked	2.25/	2.75
No. 1 Roofing Rags	1.40/	1.50
No. 2 Roofing Rags	1.25/	1.35
No. 3 Jute Bagging	1.15/	1.25
No. 4 Brussels & hrd. bck'd crpts.	1.25/	1.35
No. 5A Roofing Rags	1.25/	1.35

New Foreign Cotton Cuttings

(Prices to Mill, F.o.b. Dock, N. Y.)

	Per 100 lbs.	
New Dark Cuttings	$5.50/	$5.75
New Mixed Cuttings	6.25/	6.50
Light Silesias	9.25/	9.50
Light Flannelettes	9.25/	9.50
New White Cuttings	12.00/	13.00
New Unbleached Cuttings	12.25/	13.00
Fancy Shirt Cuttings	6.50/	7.00
Light Prints	7.75/	8.00
Bleachable Khaki, No. 1	7.00/	7.50
Unbl. Khaki, No. 1	6.25/	6.75

Old Foreign Rags

(Prices to Mill, F.o.b. Dock, N. Y.)

	Per 100 lbs.	
No. 1 White Cottons	— /	—
No. 2 White Cottons	— /	—
No. 3 White Cottons	— /	—
No. 4 White Cottons	3.50/	3.75
Extra Light Prints	6.50/	7.00
Old Light Prints	4.50/	5.00
Med. Light Prints	4.00/	4.50
Dutch Blue Cottons	5.25/	5.50
Checks and Blues	3.25/	3.50
Linsey Garments	2.15/	2.25
Dark Cottons, European	2.00/	2.10
Dark Cottons, Egyptian	1.90/	2.00
Old Shopperies	nominal	
New Shopperies	nominal	

Bagging

(Prices to Mill, f.o.b. N. Y.)

	Per 100 lbs.	
Foreign Gunny, No. 1	$8.00/	$8.50
Domestic Gunny, No. 1	7.50/	8.50
Heavy Wool Tares	7.50/	7.75
No. 1 Scrap Bagging	7.25/	7.50
Roofing Bagging	1.10/	1.20
Foreign Manila Rope	5.50/	5.75
Domestic Manila Rope	6.00/	6.25
Jute Strings	7.00/	7.25
No. 1 Sisal Strings	5.25/	5.50
Mixed Strings	1.50/	1.75

Waste Paper

Base Prices to Mills for Average Packings F.o.b. New York, Baled

	(Per Ton)	
No. 1 Hard White Envelope Cuts	95.00/	100.00
No. 1 Hd. Wh. Shavings, unruled	80.00/	85.00
Super Soft White Shavings	80.00/	85.00
No. 1 Soft White Shavings	60.00/	65.00
No. 1 Fly Leaf Shavings	40.00/	—
No. 1 Gd'wd Fly Leaf Shavings.	30.00/	35.00
No. 1 Heavy Books & Magazines	19.00/	21.00
Mixed Books	13.00/	15.00
No. 1 White Ledger	45.00/	50.00
Col. Ledger	35.00/	40.00
Manila Tab. Cards	50.00/	55.00
New Manila Envelope Cuttings	60.00/	65.00
Extra Manilas	20.00/	25.00
Mxd. Kraft, Bag Cuttings	45.00/	55.00
Kraft Envelope Cuttings	55.00/	65.00
Triple Sorted, No. 1 Brown Soft Kraft	35.00/	40.00
New Kraft Corrugated Cuttings	30.00/	35.00
No. 1 Assorted Old Kraft	30.00/	35.00
Used Kraft Bags	30.00/	35.00
New Jute Corrugated Cuttings	18.00/	—
Old Corrugated	14.00/	15.00
No. 1 News	13.00/	14.00
No. 1 Mixed Papers	6.00/	7.00
Box Board Cuttings	7.00/	8.00
White Blank News	60.00/	65.00
Overissue News	17.00/	18.00
Sulphite Mill Wrappers	12.00/	14.00

Twines

All Prices Nominal, F.o.b. Mill

(Soft Fiber)		
Coarse Polished—India	.35½/	.36½
Fine Polished India	.41½/	.45
Unpolished—Paper Makers	.32¾/	.34½
Tube Rope	.33¾/	.35½
Wrapping	.36 /	.38¾
Cotton	.58 /	.60
Polished Cotton	.55 /	—
(Hard Fiber)		
Mex. Sisal	.21 /	.27
Manila (Reprocessed)	.31 /	.35
(American Hemp)		
Polished Hemp	.46½/	.48
Unpolished	.35 /	.37¾

PHILADELPHIA

Domestic Rags (new)

(F.o.b. Eastern Shipping Point)

White Shirt	.10¾/	.11
Light Silesias	.07½/	.08
Black Silesias, soft	.05½/	.06
Unbleached Muslin	.10½/	.11¼
Washable Prints	.06½/	.07
Washable No. 1	.05 /	.05½
Blue Overall	.07½/	.08
Washable Shredding	.02¾/	.03¼
Fancy Percales	.06¾/	.07¼
Unbleachable Khaki	.05½/	.06½
Bleachable Khaki	.06¼/	.06¾
Men's Corduroy	.05¼/	.06
Ladies' Corduroy	.05 /	.05½
Cottonades	.05½/	.06

Domestic Rags (Old)

(F.o.b. Eastern Shipping Point)

White No. 1—Repacked	4.50 /	5.00
Mixed White	4.00 /	4.25
White No. 2—Repacked	3.50 /	3.75
Thirds and Blues—		
Miscellaneous	2.50 /	2.75
Repacked	3.00 /	3.25
Domestic No. 1 Roofing Stock	1.55 /	1.60
Domestic No. 2 Roofing Stock	1.45 /	1.50
Roofing Bagging	1.35 /	1.40
Old Manila Rope	— /	5.50

(Continued on page 42)

World Wood Pulp Markets at a Glance

Fourth-Quarter Contract Prices, Per Short Air-Dry Ton

	Delivered, with varying freight allowances		On dock Atlantic Ports		
	U. S.	Canadian	Swedish	Finnish	Norwegian
Groundwood	$80.00/$81.00	$80.00/$85.00			
Sideruns Pulping News		80.00/ 90.00			
Soda, Bleached	130.00/135.00	130.00/ —			
Sulphate, Bleached	136.00/145.00	147.50/150.00	$165.00/ —		
Sulphate, Unbl'd North'n	120.00/130.00	115.00/125.00	127.50/ —	127.50/ —	
Sulphate, Unbl'd South'n	110.00/115.00				
Sulphite, Bleached	125.00/135.00	125.00/135.00	165.00/ —	165.00/ —	165.00/ —
Sulphite, Unbleached	124.00/ —	125.00/126.00	140.00/149.00	140.00/143.00	
Sulphite, Unbl'd (Glassine) (no freight allowed)		120.00/ —			

First Quarter Indications

Bleached Sulphate, U. S., $136.00/145.00/ — ; Canadian, $147.50/150.00

Unbleached Sulphate, U. S., Northern, $120.00/130.00; Canadian $115.00/125.00 with increased freight allowances.

Unbleached Sulphite, Canadian; $125.00 with increased freight allowance.

7 REASONS

why you will find Alpha* Protein makes a superior adhesive for coating paper...

1. Alpha* Protein solution is stable over a wide temperature range.
2. Alpha* Protein is compatible with the various pigments used and binds them to the fiber of the raw stock easily.
3. Alpha* Protein adhesive has a color which does not affect, to any extent, the colors of the pigments used or their hiding power.
4. Alpha* Protein alkaline-cut adhesive permits addition of formaldehyde to coating colors to make the finished paper water resistant.
5. Alpha* Protein adhesive is free-flowing at a low water ratio. It is clean.
6. Alpha* Protein adhesive keeps pigments or other insolubles more uniformly suspended—prevents formation of hard, difficult-to-disperse masses.
7. Alpha* Protein adhesive sets quite rapidly and dries easily without undue shrinkage or interference with the finish when the paper is calendered.

*Trade Mark Registered

FREE! Concise yet complete, profusely illustrated . . . this valuable new book on Industrial Soya Proteins gives you complete details of the advantages of Alpha* Protein in coating paper. Also has chapters on the use of Alpha* Protein in the Glidden Prosize Process for paper sizing and on the use of Glidden Prosein* in adhesives and binders. Write for this book today!

The Glidden Company
SOYA PRODUCTS DIVISION
5165 West Moffat Street
Chicago 39, Illinois

QUALITY Glidden PRODUCTS

Prices

CONTINUED FROM PAGE 40

Bagging

(F.o.b. Eastern Shipping Point)

Foreign Gunny No. 1	nominal
Domestic Gunny No. 1	.07¼/ .07¾
Sisal Strings No. 1	.04½/ .05
Sisal Strings No. 2	.03½/ .04
Sisal Jute	.02¼/ .03
No. 1 Scrap	.06½/ .07
No. 2 Scrap	.03 / .03½

Waste Papers

F.o.b. Phila. Mill Prices, Baled

	Per Ton
No. 1 Hd. White Envelope Cuts.	120.00/ 125.00
No. 1 Hd. Wh. Shavings, unruled	100.00/ —
Soft White Shavings	85.00/ —
White Blank News	65.00/ 75.00
No. 1 White Ledger	65.00/ —
No. 1 Heavy Books & Magazines	20.00/ 22.00
New Manila Envelope Cuttings	75.00/ —
No. 1 Assorted Old Kraft	35.00/ 40.00
No. 1 Mixed Paper	7.00/ 8.00
Box Board Cuttings	8.00/ 10.00
New Kraft Corrugated Cuttings	55.00/ 60.00
Old Corrugated	14.00/ 16.00
Overissue News	15.00/ 16.00
No. 1 News	11.00/ 13.00

BOSTON

Waste Papers

F.o.b. Boston, Mill Prices, Baled

	Per Ton
No. 1 Hd. Wh. Shav., unruled	— / $90.00
Soft White Shavings	— / 70.00
No. 1 Fly Leaf Shavings	— / 30.00
Mixed Colored Shavings	25.00/ —
New Manila Env. Cuts, one cut	— / 65.00
Hard White Envelope Cuts, one cut	— / 100.00
Triple S'ted No. 1 Br. Soft Kraft	— / 45.00
Kraft Envelope Cuttings	70.00/ 75.00
No. 1 Heavy Books & Magazines	— / 18.00
New Manila Envelope Cuttings	— / 65.00
White Tabulating Cards	— / 70.00
White Blank News	— / 62.50
No. 1 Mixed Paper	9.00/ —
Overissue News	15.00/ —
No. 1 News	11.00/ 12.00
New Corrugated Cuttings, Kraft	— / 40.00
Old Corrugated Containers	13.00/ 14.00

Bagging

(F.o.b. Boston)

	(Per 100 lbs.)
Foreign Gunny	nominal
Domestic Gunny	9.00 / —
Domestic No. 1 Old Rope	6.00 / 6.50
Foreign No. 1 Old Rope	5.75 / 6.00
Mixed Strings	1.35 / —
Transmission Rope—	
Domestic	3.00 / —
Jute Carpet Threads	— / 4.00
Bleachery Burlap	— / 9.00
Scrap Burlap—	
Foreign	6.75 / 7.00
Domestic	8.25 / 8.50
South America	8.25 / 8.50
Austr. Wool Pouches	8.00 / —
New Zealand Wool Pouches	8.00 / —
New Burlap Cuttings	8.50 / —
Heavy Baling Bagging	8.00 / 8.50
Paper Mill Bagging	8.00 / —
No. 1 Roofing Bagging	— / 1.40

Domestic Rags (New)

(F.o.b. Boston)

	(Per 100 lbs.)
New Light Prints	nominal
Fancy Percales	7.00 / —
White No. 1 Shirt	11.00 / —
Light Flannelettes	8.00 / —
Canton Flannels, Bleached	10.00 / —
Underwear Cutters, Bleached	11.00 / —
Underwear Cutters, Unbleached	10.50 /12.00
Silesias No. 1	7.25 / —
Black Silesias	4.50 / —
Red Cotton Cuttings	4.50 / —
Blue Overalls	— / 8.00
Soft Unbleached	11.00 / —
Blue Cheviots	7.00 / —
Fancy	5.50 / —
Washable	6.00 / —
Khaki Cuttings	6.00 / —
Corduroy	4.00 / —
Men's Corduroy	4.50 / —
Khaki Canvas	— / 6.00
B. V. D. Cuttings	11.00 / —

Domestic Rags (Old)

(F.o.b. Boston)

	Per 100 lbs.
No. 1 Whites, Repacked	4.00 / 4.25
No. 1 Whites, Miscellaneous	3.00 / 3.75
No. 2 Whites, Repacked	2.50 / —
No. 2 Whites, Miscellaneous	2.25 / —
Twos and Blues, Repacked	1.75 / 2.00
Old Blue Overalls	3.00 / 3.25
Thirds and Blues, Repacked	1.75 / 2.00
Black Stockings	nominal
No. 1 Roofing Stock	— / 1.45
No. 2 Roofing Stock	— / 1.35
No. 3 Roofing Stock	— / .90
No. 4 Roofing Stock	— / .90
No. 5, Quality A.	— / 1.20
Old Manila Rope	6.00 / —

CHICAGO

Waste Paper

(F.o.b. Chicago) Mill Prices, Baled

Shavings—	
No. 1 Hard White Envelope cuts, one cut	$100.00/ —
No. 1 Hard White Shavings, unruled	90.00/ —
No. 1 Soft White Shavings	80.00/ —
No. 1 White Ledger	60.00/ —
No. 1 Heavy Books & Magazines	28.00/ 30.00
White Blank News	50.00/ —
Mixed Kraft Env. & Bag Cuttings	70.00/ —
No. 1 Assorted Old Kraft	25.00/ —
Overissue News	22.00/ —
No. 1 News	— / 18.00
No. 1 Mixed Paper	9.00/ —
Old Corrugated	14.00/ 15.00
Mill Wrappers	11.00/ —

Markets

Blanc Fixe

Demand steady. Dry direct process supply good. Currently quoted at $85.00 in bags, car lots at works, 6 cents per pound, l.c.l., deld. By-product supply somewhat restricted. Quoted at $77.50 per ton, car lots, at works, 6 cents per pound, l.c.l., deld.

Bleaching Powder

Prices unchanged. Demand continues good. Supply adequate. Prices range from $4.25 to $4.75 per 100 pound drums, l.c.l.,works.

Casein

Some improvement noted in demand. Prices considered controlling factor in use of substitutes and imported product. Argentine export tax to up price by 1½ cents. Foreign inquiry now firms price. Current prices on processed acid precipitated casein at 28 to 32 cents per pound for domestic grades and 26½ to 27 cents for imported grades, f.o.b. shipping point.

Caustic Soda

Liquid types in good supply. Flaked and solid improving but still tight. Solid caustic is reported at $3.10/$3.20 per cwt. flaked and ground is quoted at $3.50 per cwt., in 400 pound drums, $4 to $4.45 per cwt. in 100 pound drums —car lots at works; liquid 50 percent in tank cars at $2.50 per cwt.; liquid 73 percent in tank cars at $2.60 per cwt., at works.

China Clay

Supply adequate to heavy demand. Domestic filler quoted at $10 to $12 per ton, car lots, f.o.b. mines. Coating clay is $16 to $22. Imported clay quotation, short tons, $16 to $35, export warehouse.

Chlorine

Supply tightened by increased demand. Shortage of tankcars and multi-unit containers hampers delivery. Currently quoted at $2.40 per cwt. in single unit tank cars; at $2.70 to $3.90 per cwt., in multi-tank cars, f.o.b., works.

Rosin

Savannah and local markets unchanged. Demand easy. Prices steady. Export activity good. Gum rosin in drums per 100 pounds net in car lots, f.o.b., Savannah; B, $6.51; G, H, I, K, $7.72. Wood rosin per 100 pounds net, car lots, f.o.b. Savannah; B, $5.00; FF, $6.50.

Rosin Size

Heavy demand. Supply good. Seventy percent gum and pale wood grades, tank cars, $6.30 to $6.40, f.o.b. southern shipping point.

Salt Cake

Supply good. More efficient use has cut industry needs. Prices steady. Domestic salt cake quoted at $27.00, f.o.b. shipping point, freight allowed to destination.

Soda Ash

Delivery good. Increased production and eased demand from other industries makes supply condition favorable. Current prices, car lots per 100 pounds; in bulk, $1.15; in paper bags, $1.40; and in barrels, $1.90.

Sodium Bicarbonate

Production good. Demand eased by better supply of other alkalis. Reported as $1.95 per cwt. paper bags, carload lots.

Starch, Corn

Demand moderate. Supply ample. Prices firm parelleling corn markets. Pearl grade quoted at $4.82 per 100 pounds; powdered starch at $4.93 per 100 pounds; car lots, f.o.b. Chicago.

Starch, Potato

Demand improved. Prices stronger though largely nominal. Supply ample. High grade quoted at $4.80/$5.00 cwt. f.o.b. Idaho; $5.10/$5.25 f.o.b. Maine; Pearl grade, $5.00/$5.15 cwt. f.o.b. Maine.

Sulphate of Alumina

Supply good. Price steady. The commercial grades are quoted from $1.50 per 100 pounds, in bags, car lots, f.o.b. works. Iron free is $2.50 per 100 pounds in bags, car lots, at works.

Sulphur

Supply and demand good. Annual contracts are quoted at $18 per long ton, f.o.b. mines; export price f.o.b. at Gulf ports is $22.00 per long ton.

Talc

Demand continues in excess of supply. Improvement seen by early 1949. Prices steady. Domestic grades are currently quoted at $23 per ton in paper sacks, f.o.b. mills; Canadian at $35 and up per ton. All prices in car lots.

Tapioca Flour

Market quiet. High grades in fair supply. Superior high range from $10.25/$11.50 cwt.; high grades $9.25 cwt., on dock Atlantic and Gulf ports; medium grades range from $6.00/$7.50 cwt. on dock, N. Y. Coarse pearl grades, $5.00/$5.50 cwt. on dock N. Y. Medium and low grades in adequate supply.

Titanium Dioxide

Prices advance 1¼ cents, actual freight allowed. Supply of paper grades continues unequal to demand. Shipments on allocation. Improvement in supply delayed to 1951. Anastase 19½c pound carload lots, 20c l.c.l., rutile, 21½c pound carload lots, 22½c l.c.l.; 50-pound bags, f.o.b. plant, actual freight allowed.

Chlorine

Soda ash

Caustic soda

Columbia, with its affiliate, Southern Alkali Corporation, is the nation's largest merchant producer of chlorine . . . and a leading manufacturer of soda ash, caustic soda and other alkalies.

PITTSBURGH PLATE GLASS COMPANY
COLUMBIA CHEMICAL DIVISION
FIFTH AVENUE AT BELLEFIELD • PITTSBURGH 13, PA.

Chicago • Boston • Cleveland • New York • Cincinnati • St. Louis • Minneapolis • Philadelphia
Charlotte • San Francisco

PAINT • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

P-7172

UNDERWRITERS
DEALERS
BROKERS

Industrial, Utility, Railroad Bonds

Preferred and Common Stocks

•

KIDDER, PEABODY & CO.

Founded 1865

Members
New York and Boston Stock Exchanges and New York Curb Exchange

NEW YORK BOSTON
PHILADELPHIA CHICAGO

Sales and Branch Offices

Albany Newport
Altoona Providence
Baltimore Reading
Lowell Scranton
Minneapolis Springfield
New Bedford Wilkes-Barre

New York Teletype NY 1-193

Financial Record

	Per Share Calendar Year 1947	Earnings 12 Mos. to Approx. 9/30/48	Indic. Annual Divid. Rate	Dec. 15 Closing Market Price
Preferred Stocks				
Armstrong Cork Co. $3.75 Cum.	$38.64*	$43.53*i	$3.75	
Armstrong Cork Co. $4.00 Cum. Conv.	38.64*	43.53*i	4.00	
Celotex Corp. 5% Cum.	24.25c	26.25g	1.00	18¼
Champion Paper & Fibre $4.50 Cum.	65.90f	43.82j	4.50	93
Container Corp. of Amer. 4% Cum.	102.74	98.49	4.00	93
Crown Zellerbach $4.20 Cum.	56.40f	59.10k	4.20	
Crown Zellerbach $4.00 Cum. Conv. 2nd	211.39f	178.01k	4.00	95
Dixie Cup Co. $2.50 Cum. Conv. Cla	9.16	9.61	2.50	46⅞
Flintkote Co. $4 Cum.	81.91	87.68	4.00	98
Robert Gair Co., Inc. 6% Cum.	18.01	15.97	1.20	17¼
International Paper Co. $4 Cum.	236.51	242.27	4.00	
Johns-Manville $3.50 Cum.	128.81	175.15	3.50	
Kimberly Clark Corp. 4½% Cum.	70.03	82.79	4.50	
Kimberly Clark Corp. 4% Cum. Conv. 2nd	95.88	114.55	4.00	
MacAndrews & Forbes 6% Cum.	62.20	59.89	6.00	
Mead Corp. 4¼% Cum.	81.56	80.43	4.25	
Mead Corp. 4% Cum. Conv. 2nd	53.34	51.89	2.00	
Paraffine Cos. Inc. 4% Cum. Conv.	152.76a	158.96	4.00	
Rayonier Inc. $2 Cum.	13.58	16.09	2.00	
St. Regis Paper Co. 4.40% 1st A	76.93	85.00	4.40	81
Scott Paper Co. $3.40 Cum.	43.95	54.31	3.40	90¼
U. S. Gypsum Co. 7% Cum.	211.34	300.59	7.00	173
United Wallpaper Inc. 4% Cum. Conv.	(d)1.35a	(d)6.28	2.00	23⅜
West Virginia Pulp & Paper 4½% Cum.	75.75c	78.49g	4.50	
Common Stocks				
APW Products Co.	$1.24	$1.32	$0.25	4¼
American Writing Paper Corp.	1.61	0.02	0.25	5⅛
Armstrong Cork Co.	6.41	7.17i	3.00	
Celotex Corp.	6.59e	7.15g	2.00	26⅜
Certain-Teed Prods. Corp.	3.75	3.99	1.15	13⅛
Champion Paper & Fibre	5.57f	3.81j	2.00	23⅜
Congoleum Nairn Co.	4.55	5.12i	2.25	29
Container Corp. of America	10.09	9.54	4.50	34
Crown Zellerbach	6.81f	6.70k	2.00	25⅛
Dixie Cup Co.	5.87	6.26	1.00	29
Eastern Corp.	5.02	6.51	1.00	
Flintkote Co.	6.27	6.28	3.00	29⅜
Robert Gair Co., Inc.	2.83	2.49	0.70	6¾
Great Northern Paper Co.	4.56	4.55	2.80	37
International Paper Co.	15.02	15.39	5.00	51⅞
Johns-Manville Corp.	3.17	4.28	2.00	38¼
Kimberly-Clark Corp.	4.29	5.16	1.65	20¾
MacAndrews & Forbes Co.	3.68	3.53	2.50	
Marathon Corp.	3.39c	3.93g	1.40	20
Mead Corp.	7.33	7.11	2.00	16⅛
National Container Corp.	4.13	2.86	1.20	9½
Paraffine Cos. Inc.	2.40a	2.50	1.20	19¾
Rayonier, Inc.	7.30	8.88	2.00	27½
Ruberoid Co.	10.88	12.90	3.25e	54¾
St. Regis Paper Co.	2.66	2.86	0.80	8¾
Scott Paper Co.	3.02	3.79	2.50	46¾
Sutherland Paper Co.	6.87	6.43	2.50	34
Taggart Corp.	1.29		0.60	
Union Bag & Paper Corp.	7.93	8.13	4.00	29¾
United Board & Carton	4.95b	3.39h	1.25	8
U. S. Gypsum Co.	10.00	14.36	6.00	101¼
United Wallpaper	(d)0.11a	(d)0.27	—	3
West Virginia Pulp & Paper	11.40c	11.56g	4.00	42⅛

(a) Year ended 6/30/48
(b) Year ended 5/30/48
(c) Year ended 10/31/47
(d) Deficit
(e) Plus stock
(f) Year ended 4/30/48
(g) 12 months to approximately 7/31/48
(h) 12 months to 8/21/48
(i) 12 months to approximately 6/30/48
(j) 5 months to 9/30/48
(k) 12 months to approximately 10/30/48
(*) Pro forma

Dividends Declared

River Raisin Paper Co., declared a regular dividend of 10 cents a share and an extra dividend of five cents, both payable December 20, to stockholders of record December 4.

Bathurst Power & Paper Co. for the nine months ended September 30, reports estimated net profit of $1,220,766, or $3.07 a share. This is an increase of 20 percent over $1,024,722, or $2.56 a share, earned in the like 1947 period.

For the third quarter net was $300,333 or $1 a share, against $269,432, or 67 cents a share, the like 1947 quarter. For the nine months estimated, net earnings before depreciation, depletion and income taxes were $2,622,887 against $2,249,720 last year.

Celanese Corp. of America has declared a dividend of 60 cents per share on its common stock, payable December 31 to stockholders of record December 17. At the same time the board also voted regular quarterly dividends for the current quarter of $1.18¾ on the first preferred stock, $4.75 series, and $1.75 per share on the 7 percent second preferred stock, both payable January 1, 1949, to stockholders of record December 17, 1948.

Union Bag & Paper Corp., has declared a regular quarterly dividend of 50 cents per share and an extra dividend of $1.25 per share on its capital stock. Both dividends are payable December 17, to stockholders of record December 10. This brings dividend payments for 1948 to $4 per share compared with $3 per share paid in 1947.

Dryden Paper Co., Ltd.—Year to September 30: Net profit, $682,548, or $3.75 each on 182,000 capital shares, compared with $396,214 or $2.64 each on 150,000 shares, the year before.

Simplex Paper Corp. has declared a five percent stock dividend and the regular 20-cent quarterly, both due December 22 on record December 15.

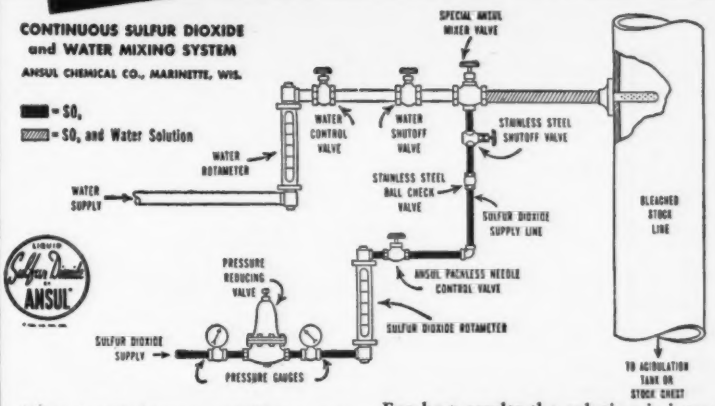
Soundview Pulp Co.—Eleven months to November 30: Net profit, $5,565,597, or $5.70 a share, against $5,918,530, or $6.06 a share, last year.

Faces Grand Jury

NEW YORK—William Ward Pigman, a 38-year-old chemist on the staff of the Institute of Paper Chemisry, Appleton, Wis., and listed in the 1948 roster of the Technical Ass'n. of the Pulp & Paper Industry as an active member of the latter organization, appeared under subpoena before the Federal Grand Jury investigating the Chambers-Hiss spy case here on December 12. Mr. Pigman, a former employe of the U.S. Bureau of Standards, was named by Representative Karl Mundt (R—S.D.), acting chairman of the House Committee on Un-American Activities, as the third and last man on Mr. Chambers' list of persons who allegedly fed him secret documents for Russian spies.

Mr. Pigman, in a statement released by his attorney, Leslie H. Arps, "unqualifiedly" denied that he had "ever given to Chambers or to any other person any unauthorized governmental information." He also denied that "I have ever had any dealings with Whittaker Chambers or that I ever knew the man." Mr. Pigman said he had answered all questions put to him at the grand jury session.

COLOR REVERSION TROUBLE . . ?
STABILIZE MAXIMUM
Brightness
IN BLEACHED KRAFT PULP
with an
ANSUL SULFUR DIOXIDE
"POSITIVE CONTROL" SYSTEM



This Ansul System provides a continuous metered flow of sulfur dioxide and water solution at any desired concentration and rate of flow.

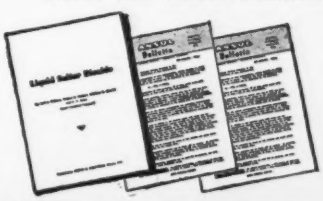
For best results the solution is introduced into the pulp ahead of the acidulation tank. It may also be added to stock chest or to a stock line from a washer.

Ansul Sulfur Dioxide is an inexpensive acidifying agent . . . thoroughly efficient and perfectly suited to the acidulation step in the preparation of bleached kraft pulp. The Ansul Concentration System provides for POSITIVE CONTROL OF ACIDULATION.

Ansul Sulfur Dioxide brightens the pulp and prevents color reversion across the paper machine and in storage because it:

1. Reduces colored ferric compounds to the soluble ferrous state so they may be easily washed from the pulp.
2. Brightens the pulp by adjusting the pH to the desired concentration.
3. As an anti-chlor, removes residual chlorine thus preventing the formation of oxy-cellulose compounds which, on aging, results in discoloration of the finished product.
4. Enables organic lime compounds to be removed by washing.

WRITE THE ANSUL TECHNICAL STAFF FOR FURTHER INFORMATION



Write today for these bulletins:

"A Method for Continually Preparing Sulfur Dioxide Solutions."

"Use of Sulfur Dioxide for Acidulation of Bleached Kraft Pulp."

Also, send for your copy of: "Liquid Sulfur Dioxide."

ANSUL CHEMICAL COMPANY
INDUSTRIAL CHEMICALS DIVISION, MARINETTE, WIS.
60 E. 42nd St., New York — 535 Chestnut St., Philadelphia

United States Imports and Exports

Pulpwood, Wood Pulp, Paper, Paperboard and Paper Products

September, August and First Nine Months of 1948—Preliminary Figures

(In short tons except where otherwise indicated)

WASHINGTON — October imports of wood pulp into the United States totaled 148,777 short tons, showing a decrease for the fourth successive month, the Office of International Trade, Department of Commerce, reports.

The decrease from September to October resulted from a reduction in imports from Canada of about 16,000 tons which more than offset an increase in imports from Scandinavian countries, OIT officials said in analyzing Bureau of Census statistics.

Although the lifting of the Swedish Equalization Fund tax early in September led to a reduction in wood pulp export prices, it is estimated that only

(Continued on page 48)

IMPORTS

Item	September 1948	September 1947	August 1948	First 9 Months 1948	First 9 Months 1947
Pulpwood, total (in cords of 128 cu. ft.)	192,038	190,315	211,473	1,586,761	1,375,291
Rough	93,743	116,446	115,495	735,736	743,156
Peeled	95,129	71,547	87,674	785,276	577,129
Rossed	56	216	54	738	459
Chipped	3,110	2,106	8,250	65,011	54,547
Wood Pulp, total	154,783	186,631	179,342	1,719,505	1,710,314
Bleached, sulphite, rayon and special chemical grades	24,164	20,727	23,571	189,038	179,935
Bleached sulphite, other	25,232	23,310	22,999	239,708	213,299
Unbleached sulphite	40,698	54,311	55,711	539,283	556,594
Bleached sulphate	25,032	21,301	23,669	221,305	170,874
Unbleached sulphate	14,999	37,060	27,159	278,630	346,635
Soda pulp	1,899	1,864	2,255	18,422	14,906
Chemical screenings	440	685	288	6,622	6,939
Bleached groundwood	.....	.....	.....	.....	.....
Unbleached groundwood	21,905	26,934	23,264	223,119	217,555
Groundwood screenings	414	439	426	3,378	3,577
Waste Fibrous materials, total	7,156	5,804	7,886	75,059	50,987
Rags for paper stock	763	782	1,394	16,568	8,929
Other pulp, rag, straw, esparto, etc.	4	.....	.....	4	31
Other waste fibrous materials	6,389	5,022	6,492	58,487	42,027
Paper, paperboard and paper products, total	363,475	368,480	405,913	3,349,076	3,020,490
Paper and paperboard, total	362,962	368,225	405,398	3,344,447	3,016,907
Paper, total	357,791	364,141	399,464	3,287,397	2,973,420
Newsprint	349,476	357,998	389,729	3,207,036	2,897,451
Printing, and book paper, uncoated	7,343	5,059	7,940	62,120	57,623
Fine paper, total	39	36	42	471	594
Writing paper	6	10	9	86	68
Cover paper	.....	.....	.....	1	(1)
Bristols	7	(1)	1	12	2
Thin paper	23	23	28	336	461
Other fine paper	3	3	4	36	63
Wrapping, bag, and converting paper, total	854	1,013	1,722	16,142	16,435
Greaseproof	(1)	....	(1)	29	51
Vegetable parchment	....	....	1	12	5
Kraft wrapping	565	832	1,226	8,768	6,708
Wrapping, except kraft	289	181	495	7,333	9,671
Tissue and crepe paper	23	13	(1)	1,258	812
Absorbent paper	42	2	1	90	41
Building paper	14	20	30	280	464
Paperboard, total	5,171	4,084	6,034	57,050	43,487
Kraft container board	....	....	....	604	.....
Other container and boxboard	....	5	....	25	2,745
Other paperboard	3,443	1,073	4,028	33,298	15,393
Fiber insulation board	...	133	....	187	1,202
Wall board	1,728	2,873	2,006	22,936	24,147
Paper products	513	255	415	4,629	3,583

[1] Less than one-half ton.

r Revised; subject to further revision.

Note: Figures are preliminary; subject to revision.

Source: Prepared in the Forest Products Branch, Office of International Trade. Data from the Bureau of the Census, United States Department of Commerce.

EXPORTS

Item	September 1948	September 1947	August 1948	First 9 Months 1948	First 9 Months 1947
Pulpwood (in cords of 128 cu. ft.)	340	4,203	....	33,377	66,905
Wood pulp, total	423	11,603	r7,733	71,473	95,394
Bleached sulphite, rayon and special chemical grades	386	1,092	r1,531	12,387	8,473
Bleached sulphite, other	....	3,215	696	13,815	32,272
Unbleached sulphite	20	4,215	4,760	38,192	41,943
Bleached sulphate	....	250	....	626	2,182
Unbleached sulphate	....	2,831	703	5,084	8,076
Soda pulp	....	....	....	534	569
Screenings and other wood pulp	17	....	43	835	1,879
Waste fibrous materials, total	10,145	13,260	11,649	118,958	130,999
Overissue news	700	1,267	3,659	17,535	28,085
Other waste paper	8,251	10,833	6,380	87,171	90,928
Rags for paper stock; valued at $50 or over per ton	83	205	213	2,528	2,812
Rags for paper stock; valued under $50 per ton	692	739	760	7,163	6,126
Other paper stock	419	216	637	4,561	3,048
Paper, paperboard and paper products, total	29,233	41,164	37,098	302,470	349,800
Paper and paperboard, total	22,209	31,990	27,925	223,987	259,988
Paper, total	10,563	17,500	13,712	125,061	158,802
Newsprint	1,899	2,115	2,179	21,184	20,598
Book paper, uncoated	3,496	4,501	4,680	36,636	39,268
Fine paper, total	2,528	5,002	3,261	33,888	51,228
Writing paper	1,768	3,526	2,226	21,664	35,400
Cover paper	119	303	82	888	2,580
Bristols	132	478	323	4,237	4,505
Cigarette paper	509	695	630	7,099	8,743
Wrapping, bag, and converting paper, total	1,626	3,762	2,245	21,664	31,343
Greaseproof and waterproof paper	530	995	564	6,878	10,547
Wrapping, except kraft	318	1,082	701	7,092	11,834
Kraft wrapping	778	1,685	980	7,694	8,962
Tissue and crepe paper	298	561	476	3,855	5,849
Blotting paper	273	455	173	2,084	3,452
Sheathing and building paper	443	1,104	698	5,750	7,064
Paperboard, total	11,646	14,490	14,213	98,926	101,186
Kraft container board	5,323	5,033	8,463	40,742	34,806
Other container and boxboard	616	1,580	1,078	6,050	9,167
Other paperboard	3,876	3,657	1,664	24,862	26,414
Fiber insulation board	682	3,063	1,591	13,861	21,252
Wallboard	1,149	1,157	1,417	13,411	9,547
Paper products, total	7,024	9,174	9,173	78,483	89,812
Surface-coated paper	539	1,819	563	9,971	16,042
Toilet paper	588	569	525	5,468	5,848
Paper towels and napkins	98	142	172	1,511	1,550
Filing folders, index cards, and other office forms	127	113	93	1,414	1,195
Papeteries	1	18	2	48	366
Wall paper	2	58	5	78	576
Shipping sacks	1,864	1,765	3,569	17,779	14,263
Paper bags	796	707	638	5,315	8,108
Shipping containers	533	730	333	6,926	6,701
Boxes and cartons	405	546	675	4,053	5,421
Envelopes	39	96	73	671	982
Cash-register and adding-machine paper	326	481	207	3,092	3,162
Other paper and products	1,706	2,130	2,318	22,157	25,598

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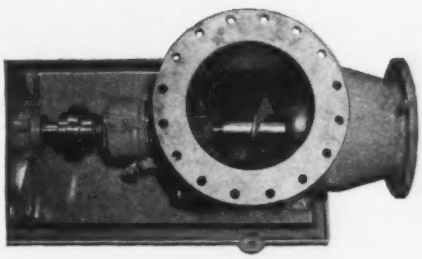
Six of the new *Pulp Pumps*---- in series with the new BJ screw feeder pump, handle 8 to 10% Stock with ease

8 TO 10% STOCK IS HEAVY! But not too heavy for the pumping set-up engineered by BJ for a large Mid-Western pulp mill. Six 100 hp, 6″ x 12″ BJ *Special Duty* Pulp Pumps operate in a series. The suction of the first pump is fed by a 16″, 15 hp BJ Screw Feeder Pump. No suction line trouble, no clogging. Flow is smooth and positive. (These *Special Duty* Pulp Pumps are identical in design to the new *standard line* of BJ Pulp Pumps, except for impeller size.)



Top view of BJ Screw Feeder Pump

THE NEW BJ PULP PUMPS can be converted to acid and liquor service (or back to pulp stock service) merely by changing a few pump parts. For hot service, the standard stuffingbox can be replaced with water-jacketed stuffingbox. Entire bracket, rotating element and pump cover can be unbolted and lifted free from case without disturbing suction and discharge piping. Impeller clearance adjustable without dismantling. *Standard Pump Capacities to 4000 gpm. Heads to 200 ft. Sizes to 10″.*

BJ PULP PUMPS
STOCK CONSISTENCY RANGE

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Normal Range	Up to 6%	
Range with Screw Feeder Pump in Series	6% to 8%	8% to 10%

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India's Paper, Present and Projected

OTTAWA — The production of paper, it is considered, should play an important part in the development of India as it is the medium by which illiteracy can be overcome, reports Richard Grew, Commercial Secretary for Canada at Delhi, India, in a statement for Foreign Trade of the Department of Trade and Commerce, Canadian Government.

Some time previously a survey was undertaken to study the future of this industry and the estimate of production and consumption shown in Table I

TABLE I

Production, Consumption Estimate India, 1951-1956

	1,000 Tons			
	1951		1956	
	Consumption	Output	Consumption	Output
Papers of all kinds	280	189	422	352
Boards of all kinds	75	75	119	119
Total	355	264	541	471
Balance to be imported	*91*		*70*	

for 1951 and 1956 was made for India, Mr. Grew states. This production schedule is believed to be insufficient for the requirements of the country, Mr. Grew adds, and it is suggested that efforts should be made to attain the 1956 production by 1952. With the exception of boards, which do not present as difficult a problem as paper, it is estimated that 352,000 tons would be required within a period of five years. Present production is not more than 87,000 tons and it is considered that a production of 250,000 tons within the period is the highest that should be attained, leaving 102,000 tons to be imported. Proposed 1952 production, as well as present production, are shown in Table II.

TABLE II

Proposed Targets for 1952 Indian Paper Production

	(1,000 Tons)	
	Present	1952
White printing	75	150
Cheap wrappings	..	24
Kraft	10	20
Sand paper	very small	7
Grease-proof	..	2
Miscellaneous	2.5	7
Newsprint	..	40
Total	87.5	250

The most important directions in which leeway has to be made up are printing and writing papers and newsprint, Mr. Grew continues. India has the required raw materials, but newsprint production will be quite a new line and will present some special problems. Even after the country is able to produce 40,000 tons of newsprint from its spruce, fir and other timber, he states, it will need to import about 60,000 tons from other countries. To reach the target for 1952, it wil be necessary to import not only newsprint but 36,000 tons of cheap wrapping paper and a small tonnage of special varieties such as art and chromo papers.

The difference between the present production and the planned production for 1952 is 162,500 tons, Mr. Grew points out in his report, and for this increase about 16 additional pulp and paper units, each with a capacity of about 10,000 tons per year, are required. The estimated cost of 16 such units is Rs.14 million each or Rs.224 million, of which amount roughly Rs. 150 million will be spent abroad.

There are believed to be ample supplies of the raw materials in the country, such as bamboo, grass, bagasse, waste paper, rags, etc., besides timber, such as spruce and fir, for newsprint, Mr. Grew indicates. The only raw material which has to be imported, though on a fairly small scale, is woodpulp. If the supplies of spruce and fir in the Himalayas are utilized for the manufacture of chemical and mechanical pulps, not only wil the problem of newsprint be solved but some pulp will also be available for the manufacture of special varieties which have to be imported at present. The main chemicals required are soda ash, salt cake, caustic soda, chlorine, lime, rosin and alum. Although all these are made in India at present on a small scale, he states additional chemical units will have to be installed for increased production of paper and other goods. It is estimated that the additional labor which will be required to achieve this production target will be 24,000 in the factories alone. Reckoning the ex factory price of a ton of paper to be Rs.840, and deducing from this the cost of coal, chemicals, stores, packing, depreciation of plant, etc., it is estimated that Rs.92 million can be added to the national wealth by this increase in production, Mr. Grew points out.

U. S. Imports-Exports

(Continued from page 46)

about ten percent of the United States importers dropped their third quarter options to purchase pulp have reinstated their contracts for the fourth quarter.

Fourth-quarter imports of pulp from overseas are expected to show a further decline because of continued United States consumer resistance to Scandinavian prices and an easier supply situation in domestically produced pulp, OIT reported.

October imports of wood pulp from all sources were only 0.5 percent under the total imports for September and 24 percent under the total imports for October a year ago. Imports from Canada, which kept its status of principal supplier in both years, decreased 18,203 tons or 13 percent from October 1947. Similarly, imports from Norway, a minor supplier, decreased 264 tons or 20 percent.

On the other hand October imports from Sweden, which ranks next to Canada as a principal supplier, increased slightly compared with September but were 19,146 tons or 54 percent under October 1947. Imports from Finland increased 8,020 tons or 240 percent from September, but were 7,454 tons or nearly 40 percent less than October 1947. Imports from Scandinavia as a whole were 11,610 tons or 28 percent above September 1948 but 26,864 tons or 48 percent below October 1947.

September imports of pulpwood declined 9 percent from August. This decline is attributed mainly to the seasonal factor. In the first nine months of 1948 pulpwood imports from all sources totaled 1,586,761 cords compared with 1,375,291 cords in the like period of 1947.

September imports of paper, paperboard and converted products also declined. The total was 363,475 tons, the lowest since February of this year and 10 percent below August. The decline was principally in imports of newsprint, slightly over 40,000 tons less than the August figure.

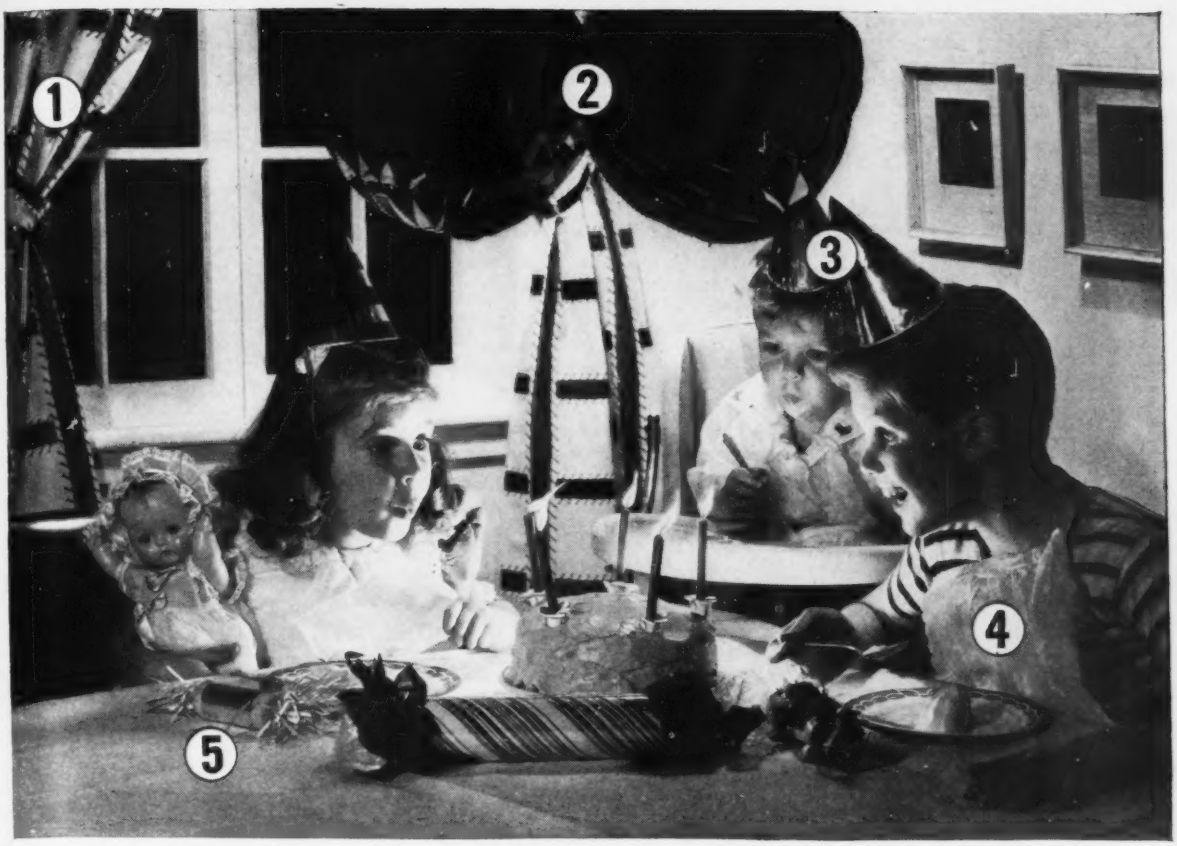
September imports of newsprint amounted to 349,476 tons, or ten percent less than in August and two percent less than September a year ago. This is the first month in which 1948 imports were less than for the corresponding month of 1947.

September imports of other papers declined from August in all grades, except for bristols, tissue and crepe, and absorbent paper. Imports of paperboard also declined. This trend reflects the over-all easier supply position in the United States.

In the first nine months of 1948, paper imports were 313,977 tons greater than in the corresponding period of 1947. This increase was almost wholly in newsprint.

Exports of all grades of paper, with the exception of cover paper and blotting paper, declined in September, mainly because of the world-wide shortage of dollar exchange.

Exports of paper, paperboard, and converted products in the first nine months of 1948 were 47,330 tons or 14 percent lower than in the corresponding period of 1947. Exports in September, the lowest since November 1946, amounted to 29,233 tons, almost 12,000 tons less than in September a year ago.



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BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Pulp and Paper Manufactures in the U. S., Oct. 1948

WASHINGTON — *Paper and Board Production* set a new monthly record of 1,943,399 tons in October, according to the Bureau of the Census, Department of Commerce. This record, 131,056 tons above the September figure, was 12,468 tons over the previous high set in March of this year. Paper production, at 975,614 tons, or 97.6 percent of the production base, was also a new high. Paperboard output, however, at 93.7 percent of the base, was 13,136 tons below the March high. Building board production continued the trend of the past few months and set a new high at 128,462 tons.

Pulpwood Receipts during October were below those of September, following the usual seasonal trend. They were, however, sufficient to meet the record consumption requirement of 1,898,323 cords and to increase the month-end stocks by 136,150 cords. Most of this increase in inventories was in the Northeast and Pacific Northwest regions where mills were stockpiling for the winter months.

Receipts of Fibrous Material other than wood pulp during the month were 49,009 tons above those of September, as increased receipts of waste paper and miscellaneous fibers offset a sharp seasonal drop in straw. Month-end stocks of these materials were increased by 21,775 tons.

Wood Pulp Production during October, at 1,157,861 tons, was nearly 100,000 tons over the September figure and exceeded the previous high set last August by 15,720 tons. Compared with the production base, the October ratio of 95.4 percent was 1.0 percent above the August rate of activity. An increase of 57,613 tons in the sulphate grades, which operated at 99.3 percent of the base, accounted for much of the increase over the September figures.

Wood Pulp Inventories at paper and board mills were 27,447 tons below those of September 30, as consumption exceeded receipts. This decrease in month-end stocks was shared by all classes of mills; the nonintegrated mills accounted for 15,032 tons of the total. Pulp mill stocks showed an increase of 5,488 tons, most of which was earmarked for later sale.

Material Consumption and Product Output ratios remained fairly constant, with wood pulp accounting for 77 percent of the total fibrous material "furnish" for paper and 47 percent of the total fibrous material content of paperboard. The comparative ratios for September were paper, 76 percent, and paperboard, 46 percent.

D. C. Daniel FTC Secy.

WASHINGTON — The Federal Trade Commission on December 13 announced the appointment of D. C. Daniel, 124 South Park Drive, Arlington, Va., as its secretary, effective January 1, 1949, succeeding Otis B. Johnson, who will retire December 31.

Merchant Stocks Swelling

CINCINNATI—John L. Richey, secretary-treasurer of the Paper & Twine Ass'n., reports that his "recent visits to various cities in the Middle West indicate that paper merchants' inventories are increasing with no corresponding increase in sales, in fact with many merchants reporting lower unit sales and with buyers very critical of both price and quality. In the case of fine papers, a high percentage are reporting inventories of the equivalent of 90 days sales with some instances of inventories equal to 120 days sales."

Beacon Elects Two

ST. LOUIS—L. C. Geil has been elected a director and G. J. Scherer secretary of the Beacon Paper Co.

U. S. PAPER AND BOARD: PRODUCTION, BY TYPE, OCT. 1948

(Story on Page 47)

(Tons of 2,000 pounds)

Type of Paper	1948 October [1]	1948 September [*]	October 1947
ALL TYPES, TOTAL	1,943,399	1,812,343	1,898,161
Paper, total	975,614	916,314	955,990
Newsprint	76,380	71,394	70,545
Groundwood printing and specialty paper, total	74,458	67,992	74,702
Printing	48,989	43,347	49,239
Converting	22,979	22,891	20,756
Other	2,490	1,754	4,707
Book paper, total	198,485	188,425	201,135
Printing	150,487	143,745	150,164
Converting	42,055	37,727	47,218
Other	5,943	6,953	3,753
Fine paper, total	97,366	97,510	111,114
Writing, total	69,217	72,760	84,063
Rag (including index)	10,861	11,076	14,739
Chemical wood pulp	58,356	61,684	69,324
Cover and text	6,945	6,066	8,050
Bristols (except rag index)	13,333	11,339	11,272
Thin	5,910	5,783	6,409
Other	1,961	1,562	1,320
Coarse paper, total	278,716	257,541	258,098
Glassine, greaseproof, and vegetable parchment	11,297	10,041	12,686
Wrapping, total	71,970	68,084	68,395
Unbleached kraft	35,688	33,642	30,968
Other	36,282	34,442	37,427
Bag, total	62,234	55,153	52,705
Unbleached kraft	58,103	50,474	48,683
Other	4,131	4,679	4,022
Shipping sack	55,565	56,280	50,554
Converting, total	77,650	67,983	73,758
Unbleached kraft	46,153	39,223	42,332
Other	31,497	28,760	31,426
Special industrial	25,384	25,044	25,245
Sanitary	81,223	78,777	78,070
Tissue	23,874	19,117	19,170
Absorbent	9,180	8,477	9,015
Building paper	110,548	102,037	108,896
Paperboard, total	828,456	766,159	814,678
Liners	296,874	274,964	278,479
Corrugating material	124,600	111,037	122,605
Container chip and filler board	23,736	23,287	25,693
Folding boxboard (for use in folding box plants only)	192,164	179,445	196,174
Set-up boxboard (for use in set-up box plants only)	51,466	51,347	56,691
Cardboard	6,681	6,163	7,735
All other paperboard	132,935	119,916	127,301
Wet machine board, total	10,867	10,682	12,641
Shoe board	3,620	4,034	4,873
Binder board	3,935	3,353	4,623
Other	3,312	3,295	3,145
Building board	128,462	119,188	114,852

[*] Revised.

[1] These data are estimated to give 100 per cent coverage of the industry. The proportions of estimate are as follows: Fine paper, 4 per cent; Sanitary, 9 per cent; Tissue, 7 per cent; Cardboard, 4 per cent; Wet machine board, 10 per cent; Building board, 6 per cent; and All other grades of paper and paperboard, less than 3 per cent. Data for October are preliminary and will be revised in the November report.

Source: U. S. Dept. of Commerce "Facts for Industry."

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GPO Bids Opened

(Continued from page 18)

United States Postal Card Paper

No. 325—4,750,000 lbs., 22½x28½—188; rolls, 22 ins wide, 36 ins. in diameter (6-inch iron or metal capped returnable fiber cores).

Walker Goulard Plehn Co. ..... .0966c
1,000,000 lbs. only
* Whitaker Paper Co. ..... .0859c
Mead Sales Co. ..... .101c
400,000 lbs. only
R. P. Andrews Paper Co. ..... .0823c
2,000,000 lbs. only

Pressboard, Colored

No. 351—5,000 lbs., red. Flat, cut 30x36 ins., thickness .0140 inch. Min. order, 5,000 sheets.

* R. P. Andrews Paper Co. ..... $15.73 per C sheets

No. 352—15,000 lbs., gray, flat, cut 30x36 ins., thickness .0300 inch. Min. order, 5,000 sheets.

R. P. Andrews Paper Co. ..... $36.08 per C sheets
* Barton, Duer & Koch Paper Co.... $20.58 per C sheets

Newsboard

No. 360—200,000 lbs., 26x38; No. 100; flat, cut any size, min. 21x32 ins., max. 40x52½ ins. (To be trimmed square on four sides).

Stanford Paper Co. ..... .0414c
Mudge Paper Co. ..... .04179c
Paper Corp. of U. S. ..... .04182c
Whitaker Paper Co. ..... .041c
Resolute Paper Products Corp. ..... .042025c
Old Dominion Paper Co. ..... .041598c
Mead Board Sales, Inc. ..... .04125c
* R. P. Andrews Paper Co. ..... .03994c
Barton, Duer & Koch Paper Co. .. .04109c

Binder's Board, No. 1 Quality

No. 366—15,000 lbs., No. 1. 25¾x30¾ ins., Nos. 16, 18, 20, 25, 30, and 40; flat, to trim 25x30 ins.

* Barton, Duer & Koch Paper Co.... .063c

Chestnut Cover Board

No. 369—40,000 lbs., 25¼x30¼; flat, to trim 25x30 inches, Nos. 17, 19, 21, 25,, 31, and 41.

* Mead Board Sales, Inc. ..... .0615c
* Mead Board Sales, Inc. ..... .05775c

No. 370—65,000 lbs., 25¼x30¼; Nos. 16, 19, 24, and 31. Flat, to trim 25¾x37¾ ins.

* Mead Board Sales, Inc. ..... .05775c

Pulp Importers Re-Elect

NEW YORK — All officers of the Ass'n., of American Pulp Wood Importers were re-elected for the ensuing year at the annual meeting of the Association held on December 9. The officers are: James Donaldson of the Stora-Kopparsberg Corp., president; S. G. Blankinship of the Perkins, Goodwin Co., vice-president; George N. Dutcher of the Stora-Kopparsberg Corp., secretary; V. Ramsay of the Pulp Sales Corp., treasurer, and Rolf G. Westad of the Borregaard Co., Inc., director.

Oct. Dry Casein Output

WASHINGTON — Dry casein production in October amounted to an estimated 1,100,000 pounds, 37 percent under the production a year ago, but 14 percent over the five-year October average, the Department of Agriculture reports. Stocks at the end of October in hands of manufacturers were estimated at 2,620,000 pounds, 29 percent under a month ago.

Broadening Research

NEW YORK—Foster D. Snell, Inc., 29 West Fifteenth street, has expanded its market research department to cover four forms of service: Market research, market brief, chemical index and monthly chemical report.

Commenting on the chemical index, a Snell spokesman said:

"We have abstracted market information relating to several thousand chemicals such as phenol, methyl bromide, phenolbarbital, etc., for a number of years. Whatever is available in these files may be purchased at $2 per page. Such items as foreign and domestic production, capacity, producers, plants, exports, imports, use, price are included. Contributing sources are the trade journals, Government publications, and such one-time publications as Congressional and Tariff Hearings, Government reports and prospectuses. This index may save an expensive search.

Anion Exchanger Improved

PHILADELPHIA—New operating data widening the scope and developing important processing economies in the use of a high capacity, weak-base anion exchanger have been announced by researchers at the Resinous Products Division of the Rohm & Haas Co., after an 18-month laboratory and field investigation of Amberlite IR-4B.

Advances now found to be practical include virtually 100 percent improvement in effluent quality by the use of more basic regenerants, without impairing the resin's stability; 50 percent increase in flow rate without objectionable effect on exchange capacity or effluent quality; and a 10° extension (to 105°F of previous temperature limitations.

Sulphuric Acid Plant

HAMILTON, Ont.—Canadian Industries, Ltd., has started operating its newly-opened $1,250,000 sulphuric acid plant. It is believed the plant will produce approximately 250 tons of the acid daily. Steam generated in processing the sulphur will be used in the manufacturing process and for the small adjacent building. Most of the plant equipment is outdoors and it is virtually a "buildingless" operation.

Hercules Advances Two

WILMINGTON, Del.—Dr. Richard E. Chaddock has been named manager of the sales research division of the Hercules Powder Co., effective December 1. He succeeds Carl W. Eurenius, who has been named director of sales of the company's cellulose products department.

Dropping Celluose Nitrate

NEWARK, N. J.—The manufacture of all cellulose nitrate plastic products is being discontinued by Celanese Corp., of America, W. Stuart Landes, vice president in charge of the plastics division, disclosed on December 3. Future activities of the plastics division are to be concentrated in the fields of cellulose acetate, cellulose propionate and other new materials new in the development stage.

"Cellulose acetate is taking over many of the applications of cellulose nitrate, as it has many of the advantages of that plastic without its flammability."

Enlarging Zeeland Plant

ZEELAND, Mich.—Albert Bluekamp, manager of the Northern Fibre Products Co., one of this city's newest industries, disclosed that it has started work on a 40x100 addition to the present 80x100 factory to be completed in 60 days. The company manufactures insulating pads and sound deadeners for the automotive industry.

Superior Box Building

WATERLOO, Ont.—The Superior Box Co., has structural steel framing in place and walls going up for a 3,000 square foot, $55,000 two- and three-story addition, including new boiler plant with 80-foot brick stack. Murray Dillon & Co., are the engineers and the contractor is Ball Bros., Ltd.

In Yew Street Quarters

VANCOUVER, B.C.—The recently incorporated Francis Wright Co., Ltd., paper merchant firm, has taken over a building at 2606 Yew Street. Mr. Wright, a partner of Smith Davidson & Wright Ltd., since it was formed in 1907, left the firm last July to start his own company.

Bartram Addition Opened

VANCOUVER, B.C.—The Bartram Paper Products Co., Ltd., has opened a 24,000 square foot addition to its paper processing plant here. The firm makes printed and plain cellophane bags and glassine, cellophane, grease-proof parchment and sulphite specialty products.

Jackson Guest Lecturer

NEW YORK—Norton B. Jackson, advertising manager of St. Regis Paper Co., was guest lecturer at the School of Commerce, New York University, on December 3 when he spoke on "Organization of the Industrial Advertising Department."

In New Atlanta Home

ATLANTA, Ga.—The Chain Belt Co., has established a new warehouse at 878 Ashby street, N. W., under the supervision of G. J. Schuelke. The Atlanta District office will be located at the same adress under the direction of J. S. Moore, district manager.

Wolverine Expansion

GRAND RAPIDS—Nearby Wyoming Township in mid-November approved a permit for the erection of a 120 by 220-foot addition to the plant of the Wolverine Carton Co., which will cost an estimated $135,000.

MORDEN

Applications

"Stock-Makers" are being used in the following ways:

1. For complete continuous treatment without beaters or jordans.
2. For booster treatment to supplement or add capacity to existing beating and refining equipment.
3. For separate treatment of one or more of the pulps in a mixed furnish.

Write us for a discussion of the "Stock-Maker" application best suited your mill.

MORDEN MACHINES CO.
PACIFIC BUILDING • PORTLAND 4, OREGON

IN ENGLAND
Millspaugh, Limited, Sheffield

IN CANADA
The William Kennedy & Sons, Ltd.
Owen Sound, Ontario

STOCK-MAKER
for Continuous
beating and refining

How Users Appraise the Paper Markets

Report released Dec. 10 by Paper Committee, National Ass'n., Purchasing Agents, under supervision of Chairman T. A. Corcoran, Courier-Journal and Louisville Times Co., Louisville, Ky.

The pulp situation continues to improve with a marked slackening in interest in premium-priced overseas grades. Lee Weber, in his section on pulp, predicts that foreign and domestic prices will be identical by next Spring and Summer. Department of Commerce figures show that this easier pulp situation is resulting in a greater proportion of pulp being used in finished paper and paperboard products, at the expense of wastepaper. This improves the quality and has caused a break in the price of wastepaper.

U. S. paper and paperboard mills continue to use a smaller percentage of total capacity than a year ago. A preliminary check of October shows an average of 99.2 percent, compared with 109.5 percent for October, 1947.

Wood Pulp

By H. L. WEBER

Fiberboard Products, Inc.
San Francisco, Calif.

There has been little or no change in the supply side of the pulp picture in the last month. There are, really, no shortages, although the bleached pulps and unbleached sulphite seem to be the closest in demand-supply balance.

Consumption is holding up and, with the return of quality competition, indications are there will be an increase in the demand for the bleached grades.

When you get to talking about prices, however, there is a definite difference between now and a month ago. The Swedish high-priced honeymoon is certainly over. Apparently, the buyers decided to "sit this one out," with the result that the demand for overseas pulp continued negligible. Large blocks of these pulps, in practically all grades, are being offered for shipment before closed water.

How far inventories will be depleted by the time first open water shipments start from overseas will have a definite effect on overseas prices at that time. But, regardless of this, it does appear that domestic and foreign prices will be identical, come next Spring and Summer.

Kraft Paper

By T. H. TREADWELL

W. C. Ritchie & Co.
Chicago, Ill.

The kraft market remains firm, with dealers and large users still on allotment. However, there appears to be more offering of spot tonnage. This, although at higher-than-contract price, is no longer at the extreme scalper prices which prevailed for several years, and the quality is much improved.

Whereas this indicates some easing of demand, it is likely to be quite some time before supply matches demand.

Fine Papers

By E. E. McCULLEY

Courier-Journal Job Printing Co.
Louisville, Ky

The time, perhaps, has come for management to re-examine some of the things it has done in the roistering interlude since the war. Picking up loose change by tampering with our cash discount structure — in general, and in respect to papermills and merchant operations in particular—may be one of these things that ought to be re-examined for the good of all concerned. The historical background for the use and need of cash discounts, whether or not they are good or bad, needs no repeating. When the mills changed their discount structure, which, in turn, according to the paper merchants, forced them to reduce the historical two percent discount to one percent, the economic climate was never more favorable for such a step.

Coming at a time when industry earnings were flowering to such a degree that explanations or apologies for their size were standard equipment for the higher level of sales personnel, the general reaction was very unfavorable by those who felt the application of the hot poker.

Some of the discernible results of this change now show unhealthy implications that can be destructive to a price structure that might in the foreseeable future need the help of producers and consumers in retreating to a less vulnerable level without some people getting hurt in the process.

Many think that it is time for those who can to do something about it because it is *NOT* working.

It is not working because:

It was arbitrarily done, without general consultation with the people affected most, and has created resentment on the part of the trade associations of printers and lithographers and the members.

It was not uniformly passed on by all merchants to their customers. Evasions, subterfuges and off-the-record concessions are emasculating its application, to the future detriment of good customer relations.

It is resulting in other discriminations that are extremely corrosive to a merchant's relations with his customers. Some merchants with outlets in several cities find it necessary to give two percent in one city and one percent in other cities. His integrity suffers and he may soon be wondering what is killing his business. The explanation, as with vaudeville, "the actors killed it," may seem too easy.

It is increasing the demands for price concessions at the merchant and mill level because the buyer very logically believes that, if variations in discounts exist, the price list may not mean what it says either.

Book Paper

By RALPH N. BETTS

American Education Press
Columbus, Ohio

One of the greatest factors that threatens to curtail paper production is the power shortage due to the droughts in the Wisconsin area, some parts of Canada, and northeastern United States. This situation is more critical, in view of the unprecedented demand for power. This demand has increased since the war at an average of 15 percent per year.

Production has been increased somewhat in the book paper field by the introduction, in 1948, of at least six new paper machines throughout the United States, designed to manufacture book paper and machine-coated book paper. The latest production figures available indicate that during September the over-all production was 11 percent less than in 1947, for the same month.

Demand is having its effect on prices, particularly in the pulp markets. Due to costs, pulp imports from Norway, Sweden, and Finland are starting to drop off and, at the same time, Canadian imports are increasing slightly. Wastepaper prices have dropped from as much as $5 to $8 per ton on low grades to $60 to $70 per ton on high grades.

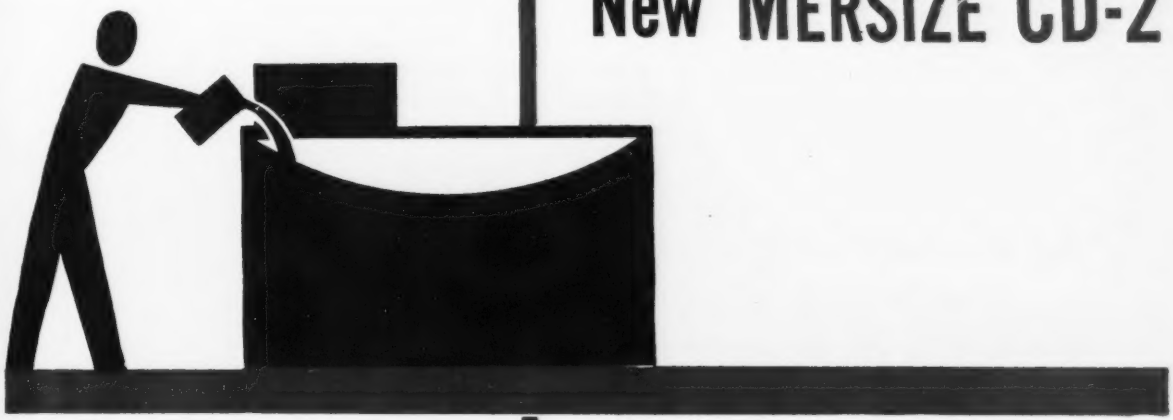
Newsprint

By T. A. CORCORAN

Drought conditions in Canada and northeastern United States, dock workers' strikes, and record-breaking advertising linage are combining to in-

(Continued on page 58)

Now . . . you can pour yourself a better size New MERSIZE CD-2



Good news for papermakers: Now you can get the extra quality of Mersize . . . in beater dispersible form; Mersize CD-2!

New Mersize CD-2 is convenient to handle, flows freely, results in less foam. Because Mersize CD-2 reduces the total amount of size required, it, in effect, increases the capacity of your size system. Mersize CD-2 delivers improved water resistance, decreased ink feathering and penetration . . . all the important results of a *better* size.

For full information, please send the coupon.

Mersize: Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS — PLASTICS

MONSANTO CHEMICAL COMPANY, Merrimac Division
Dept. PTJ M 6, Boston 49, Mass.

Please send me information on Monsanto's new Mersize CD-2.

Name _____ Title _____

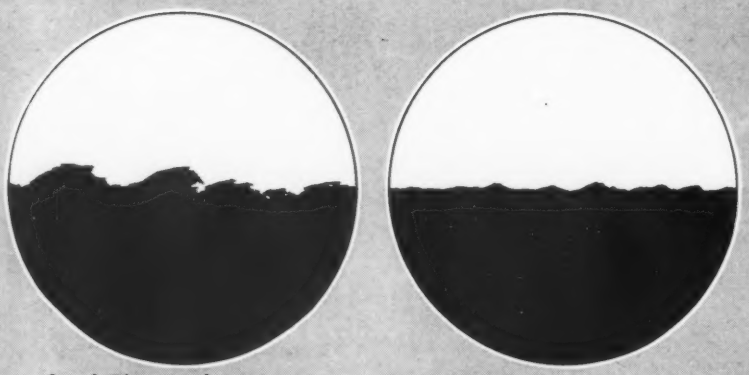
Company _____

Address _____

City _____ State _____

SERVING INDUSTRY . . . WHICH SERVES MANKIND

See the Difference!

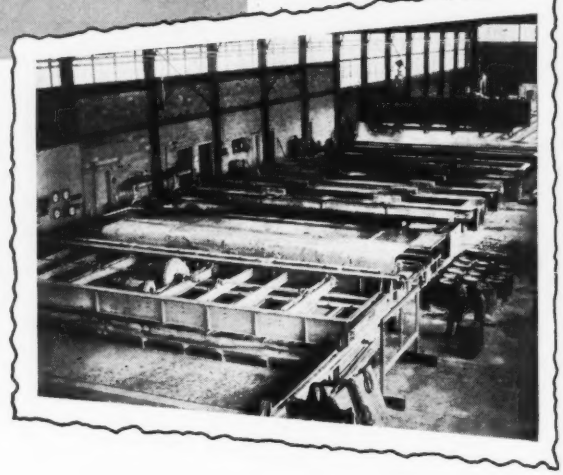


Sand Blasting leaves surfaces comparatively rough

Sodium Hydride Process preserves smoothness of Lukens Clad Steels

(50 magnifications)

Descaling a clad plate 456″ long in the World's Largest Sodium Hydride Descaling Plant



For extra-smooth, easy-to-keep-clean surfaces, specify

LUKENS CLAD STEELS with the Sodium Hydride Finish

Careful control in the Lukens cladding process produces a smooth surface. The Sodium Hydride Process preserves that smoothness, as shown in the right-hand photomicrograph. This smooth surface is easy to keep clean. It takes a high polish. It has no inclusions to cause electrolytic pitting when exposed to chemical action.

Lukens Sodium Hydride Descaling Plant can handle plates up to 178″ wide or 456″ long. Standard claddings of 10% or 20% of total plate thickness suit most applications, but other percentages are available by special arrangement. In Lukens Clad Steels, the bond between the nickel, stainless steel, Inconel or Monel and the steel backing plate is permanent. The clad thickness is uniform.

Lukens offers the most complete range of clad steels available to industry. Bulletins 255 and 338 give data on their use. For copies, write Lukens Steel Company, 403 Lukens Building, Coatesville, Pennsylvania.

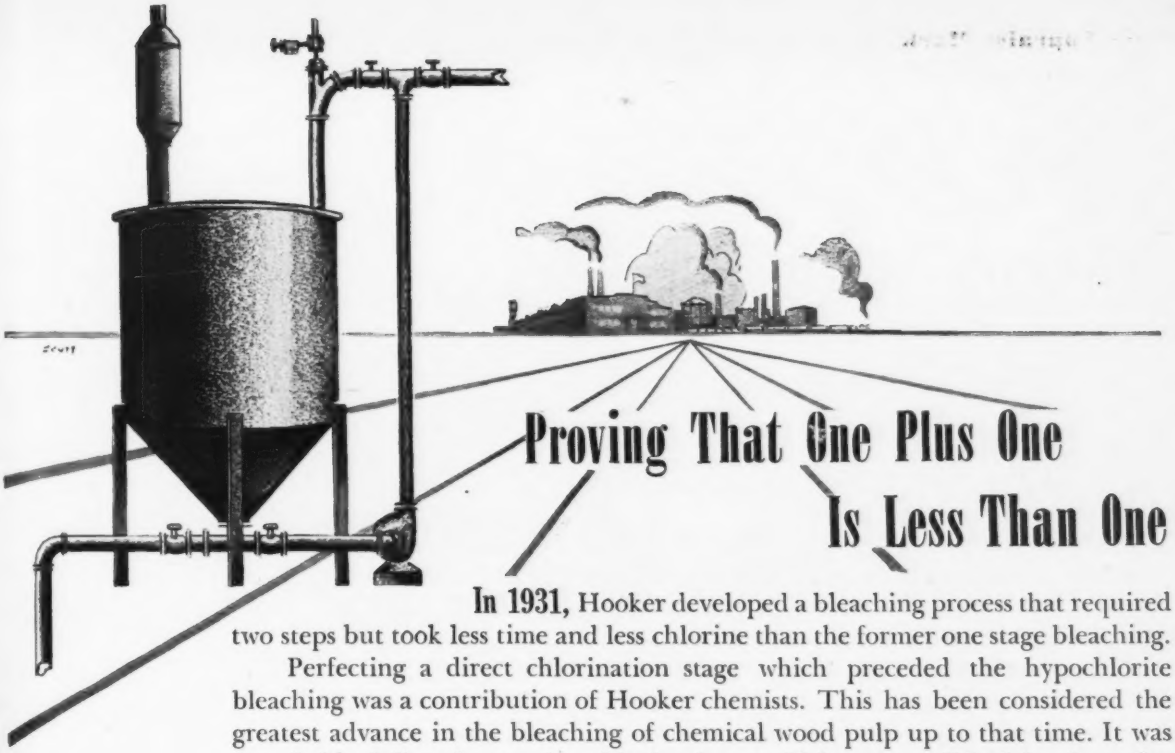
LUKENS

Nickel-Clad Stainless-Clad
Inconel-Clad Monel-Clad
STEELS

★

SOLID METAL ADVANTAGES WITH CLAD STEEL ECONOMY

• • SPEED SCRAP TO THE MILLS TO MAKE MORE STEEL • •



Proving That One Plus One Is Less Than One

In 1931, Hooker developed a bleaching process that required two steps but took less time and less chlorine than the former one stage bleaching.

Perfecting a direct chlorination stage which preceded the hypochlorite bleaching was a contribution of Hooker chemists. This has been considered the greatest advance in the bleaching of chemical wood pulp up to that time. It was found that full and extensive chlorination could be accomplished in about five minutes by adding an excess of chlorine at once. The unused chlorine was then utilized to make hypochlorite by the quick addition and mixing of milk of lime with the chlorinated pulp in the acid stage. For this procedure Hooker engineers designed a special screen for the milk of lime, helping make this stage more thorough and efficient.

This process, introduced by Hooker's Technical Staff, made it possible for the first time to bleach sulfate and even hard bleaching kraft pulps in a simple two stage operation and secure products at least as white as commercially bleached soda pulps and having a strength almost equal to that of unbleached pulp.

It is because of this pioneering in pulp and paper making that Hooker chemists and workmen know the importance of high grade chemicals in your work and why they are determined that each shipment of Hooker Chlorine, Caustic Soda and the other Hooker pulp and paper chemicals is up to its original high standard of purity and uniformity.

The work of Hooker chemists in the pulp and paper field, in the form of informative and practically helpful literature, is available upon request. Why not send for a list of these up-to-date Bulletins that may be of value to you in your work?

HOOKER ELECTROCHEMICAL COMPANY
4 UNION STREET • NIAGARA FALLS, N. Y.
New York, N.Y. Tacoma, Wash. Wilmington, Calif.

HOOKER CHEMICALS

Caustic Soda Muriatic Acid Sodium Sulfide Paradichlorbenzene Chlorine Sodium Sulfhydrate 2803

Users Appraise Markets

(Continued from page 54)

crease the sale of aspirin to newspaper people throughout the country. Many newspapers are operating on a hand-to-mouth basis and, in some few cases, literally holding presses awaiting arrival of cars of newsprint. Retail stores with large stocks of high-prices merchandise are meeting sales resistance for the first time since before the war and are clamoring for increased advertising space. Newspaper managements feel obligated to help and are taking chances with small inventories that would not seem prudent under ordinary circumstances.

Statistics show that *U. S. consumption* reached 498,950 tons in October, an increase of 10.3 percent, or 46,569 tons, over last October. The *supply* available to U. S. users in October, including imports of 20,000 tons from overseas, amounted to 446,218 tons, an increase of only 2.6 percent over October a year ago.

As a result, total North American *stocks* declined 36,649 tons during the month, standing at 655,350 tons on October 31. The decrease in the past two months amounted to 69,000 tons. 525 daily newspapers reporting to the American Newspaper Publishers Association had 36 days' supply on hand at the end of October, compared with 42 days' a month earlier, 45 days' two months earlier, and 36 days' a year ago.

Comparisons on a 10-month basis, however, are not so bad, as total consumption for this period of 1948 is 4,290,036 tons. And the receipts by U. S. users for the same period was 4,290,187 tons. Imports of 213,756 tons from Europe supplying the balance.

Boxboard

By STUART EDGERTON
United States Rubber Co.
New York City

There is little to be said concerning the boxboard market this month. Buyers of this commodity have a special reason to be thankful, because this material is as close to being in a prewar position, except for the price level, as any commodity there is. A lot of statistics and opinions could be written about the various qualities of waste, pulp, sizing, etc., which go into the make-up of this material but these are matters which every purchasing agent who buys boxboard should be informed about by his sources of supply through the occasional visits of suppliers' salesmen.

Might we suggest a more extensive use of standard commercial specifications and a very close scrutiny of sellers' extras. These, coupled with a wider use of requests for bids, could be the introduction to a better price level.

All grades of boxboard are moving freely. Quality can be maintained and improved. We believe a buyers' market is approaching.

Paper Containers

By LEE R. FORKER
Quaker Stock Oil Ref'g Corp.
Oil City, Pa.

As the end of 1948 nears, paper containers are much more available with improved quality. Very active solicitation by box companies to retain volume is evident. Inventories are lower. Prices definitely are declining, ranging between five percent and 15 percent. Forecast for early 1949 indicates that the above reported trend should continue.

West Coast Conditions

By HOPACE DUCKENFIELD
Metropolitan Life Insurance Co.
San Francisco, Calif.

There has been very little change in the situation on paper and paper commodities in our locality since our last report. The extended water-front strike has had far-reaching effect, not only up and down the Coast, but has included many inland points. It is reflected in a somewhat light demand and, although a temporary pickup has been noticed, it is not visible to any great extent.

Light demand for all lines has improved conditions at the mills, for they seem to have gotten into much better shape to make shipments. It seems apparent that they have practically a prewar normal backlog of orders, and they can and have readjusted schedules to make for quick manufacture and immediate shipment.

The supply of kraft wrapping paper and bags is not quite up to normal but almost every other line is readily available.

There could still be quite some improvement in the tissue situation.

Export Controls Eased

WASHINGTON — Restrictions barring export of certain types of twine and cord and certain grades of manila and sisal fibers have been modified, the Department of Commerce reports through its Office of International Trade. During the remainder of this year licenses will be issued for exports of binder and baler twine and for grades of manila and sisal fibers not suitable for stock-piling. Export licenses still will be required. Manila and sisal cords and twines, also previously withheld from export, may now be shipped abroad under specific export quotas.

High-Polymer Physics

NEW YORK—The Division of High Polymer Physics of the American Physical Society will hold its Sixth Meeting at Columbia University, January 27, 29, as a part of the joint meeting of the parent Society with the American Ass'n of Physics Teachers. Comprising the Division program are more than 30 papers on the physics of natural and synthetic rubbers, and plastic and filamentous materials.

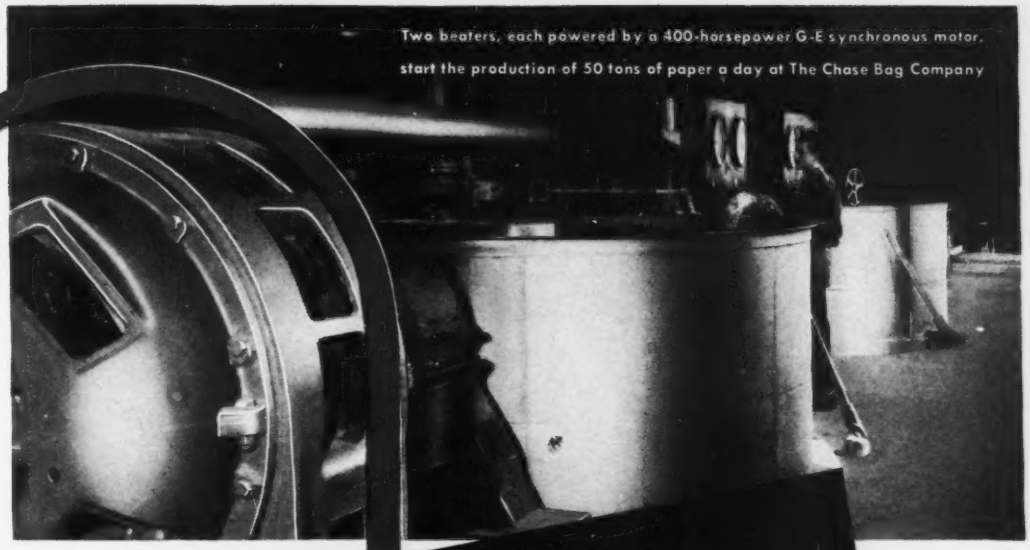
Hill Leaves NSRB

WASHINGTON — Arthur M. Hill resigned on December 6 as chairman of the National Security Resources Board, the resignation becoming effective on December 15. J. D. Mylrea is director of NSRB's Forest Products Division and Oliver M. Porter chief of its Pulp, Paper and Paperboard Branch.

MEISEL MACHINERY IS HELPING IN ALL FIELDS

Cigarette	Wax	Photographic	Jet Propulsion
Condenser	Grease Proof	Snap-out Forms	Aero-engine Parts

MEISEL PRESS MFG. CO. 950 Dorchester Ave., Boston



Two beaters, each powered by a 400-horsepower G-E synchronous motor, start the production of 50 tons of paper a day at The Chase Bag Company

protected... BY LIMITAMP

1900 horsepower's worth of paper production

At the Chase Bag Company's Chagrin Falls mill, two beaters, two Jordans, and a Fourdrinier paper machine are powered by G-E synchronous motors and a 10-unit m-g set controlled and protected by five G-E Limitamp controllers. These machines produce 50 tons of paper a day, and loss of a day's production cannot be recovered in a month or even a year if a breakdown occurs. It's important to prevent electrical disturbances resulting from short circuits—and that's where G-E Limitamp proves its worth.

Advantages for you, too . . .

In 1/120 of a second Limitamp operates to prevent the spread of short-circuit damage. These controllers are not only quick acting (because of special EJ2 fuses), but the contactors are especially designed to stand up under several million operations—providing much longer life than is usually possible for such high-voltage equipment. Limitamp is also applicable for semi-hazardous or corrosive atmospheres.

Apparatus Dept., Section G676-260, General Electric Co., Schenectady 5, N. Y.

Please send me your publication GEA-4247 describing the Limitamp controller.

NAME.....

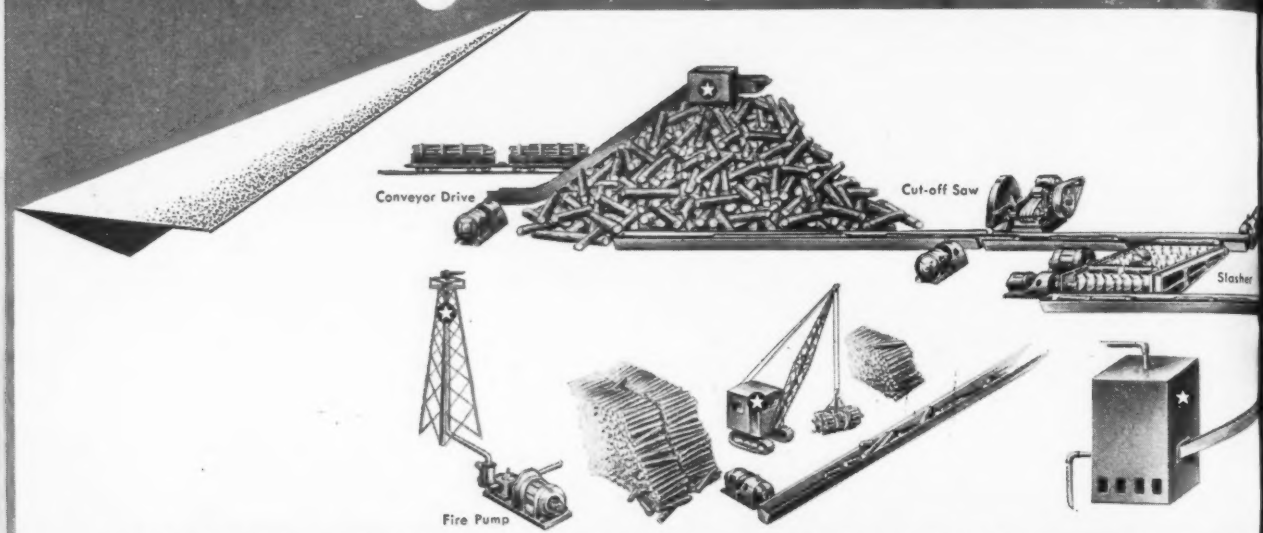
COMPANY.....

ADDRESS.....

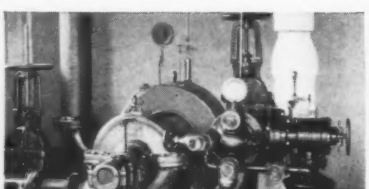
GENERAL ELECTRIC

ONE IN A SERIES: WHAT ALLIS-CHALMERS BUI

Quality Paper Starts W

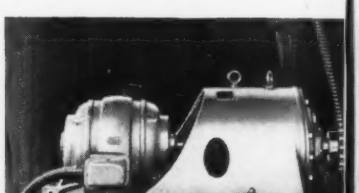


WOODROOM EQUIPMENT TO CUT WASTE, SPEED PRODUCTION, IMPROVE PULP!

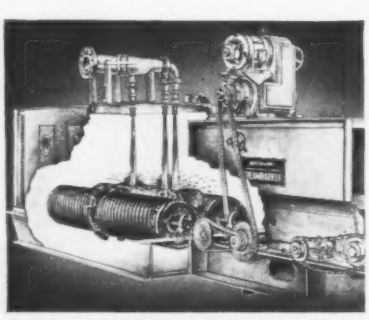


LOW-COST FIRE PROTECTION with Allis-Chalmers fire and booster pumps — heads 60 to 108 psi, capacities 500 to 1,500 gpm. Underwriters approved. Send for **Bulletin B6336.**

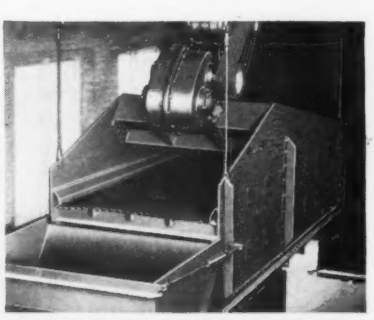
CHIPPER DRIVES vary with the mill. A-C offers squirrel-cage, wound-rotor and synchronous motors . . . bracket-bearing, pedestal or engine-mounted . . . direct or *Texrope* driven.



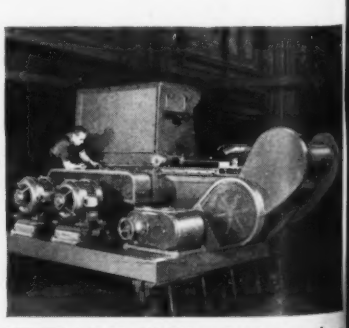
CONVEYOR DRIVES . . . *Texrope* or direct driven by any type motor built by Allis-Chalmers. Gearmotors as low as 7.5 rpm with motors are furnished in sizes 1 to 75 hp.



STREAMBARKER "peels" any reasonably straight pulpwood log — 4 to 8 ft long, 4 to 18 in. in diameter by means of water under pressure. Saves work; saves fiber. **Bulletin 26B6341.**

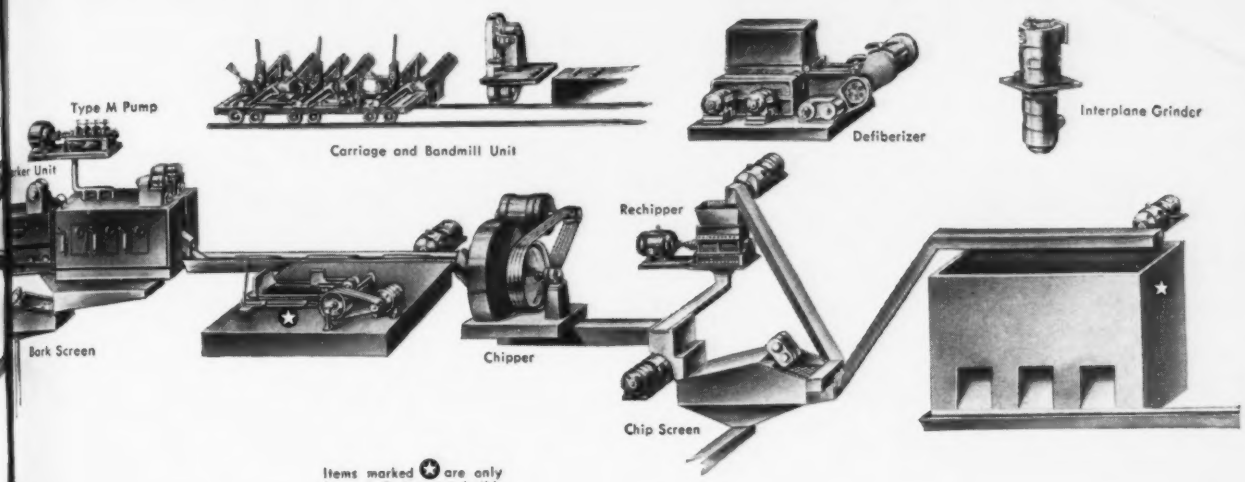


SELECT FROM TWO CHIP SCREENS — *Low-Head*, above, which assures highest percentage of uniform chips, and *Ripl-Flo*, for average percentage of uniform chips. **Bulletin 07B6353A.**



UTILIZE WOOD WASTE — *Defiberizer*, shown above, and *Interplane* grinder are Allis-Chalmers products designed to reduce wood waste to useful fiber forms at low power consumption.

OR PULP AND PAPER
ts With Clean Pulpwood!



Items marked ✪ are only items A-C does not build.

IN OTHER WORDS, quality paper demands clean, uniform chips. And that's where modern, efficient machinery like the advanced Streambarker, chip screens and other Allis-Chalmers products for the pulp and paper industry come into the picture.

A few years back an A-C inventor-engineer figured that there should be a better and cheaper way to bark logs. A modern way that would reduce fiber loss resulting from broomed log ends . . . mechanize the wood handling operation . . . save building and equipment costs . . . and directly contribute to higher grade pulp and paper!

With this aim in mind, he invented the Streambarker, which today averages between 8 and 14 cords per hour, winter and summer, in U. S. mills. It saves practically 100 percent of the fiber; saves space; saves hard work; has yet to see an equal.

But A-C didn't stop with the Streambarker. It went on further to improve two vibrating screens. The aims: to screen chips faster, more selectively and with less personal attention than was required with existing screens. The answer: "Low-Head" horizontal screens for highest quality results; and "Ripl-Flo" inclined vibrating screens for average needs.

These examples — selected from literally *hundreds* of A-C products for pulp and paper — serve to show Allis-Chalmers' growing importance as an *integral industry supplier* for pulp and paper. Because of the wide selection in many A-C lines, you get an unbiased recommendation on equipment to best fit your job. And when you specify Allis-Chalmers you can get equipment complete with motor and Texrope drive. That means one-manufacturer responsibility . . . added assurance of satisfaction!

We're ready to discuss your needs now, or in the near future. You can count on the experienced A-C equipment engineer in our nearby office to give you practical help. Meanwhile, write for 32-page "Forest to Finished Product" booklet. It describes our complete line for pulp and paper. **Bulletin 25B6827.** A 2580

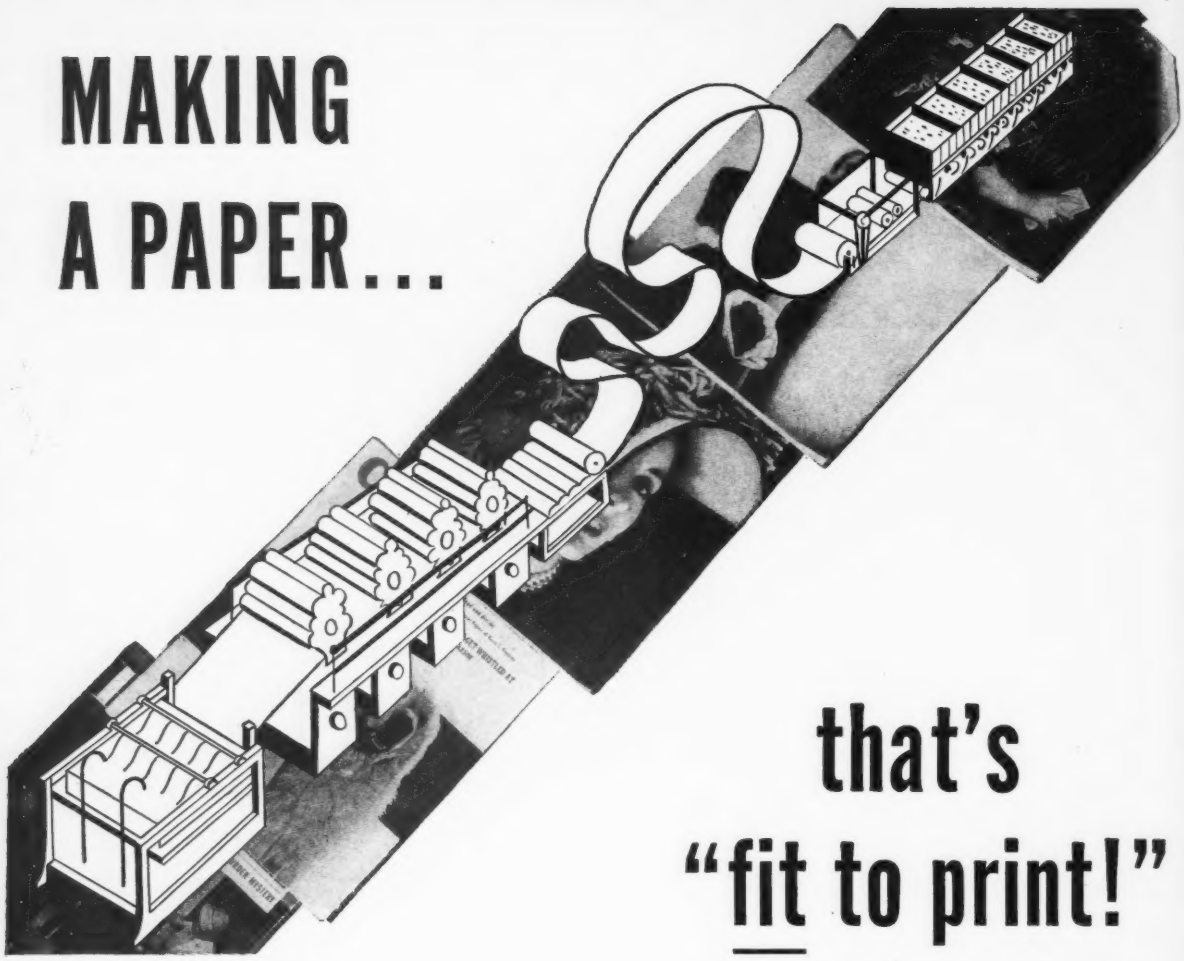
ALLIS-CHALMERS, 994A SO. 70 ST.
MILWAUKEE, WIS.

Streambarker, Low-Head, Ripl-Flo, Texrope, Defiberizer and *Interplane* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment—Biggest of All in Range of Industrial Products

MAKING A PAPER...



that's "fit to print!"

Like the star editor in the publication office, NOPCO KF* —*star "bubble-buster"*—helps the paper manufacturer to make a paper that's fit to print.

NOPCO KF improves sheet formation even at increased machine speeds by eliminating the twin foes of good paper production—excess foam and faulty fiber dispersion. Entrained air—common cause of thin spots—is dissipated as if stock were being handled at slow speeds —because NOPCO KF keeps working on the wire.

***NOPCO KF** provides these 9 advantages.* (1) *one-minute* preparation of KF emulsion . . . (2) *two-minute* dispersion of foam at head-box . . . (3) *five-minute* elimination of bubbles from wire . . . (4) at least 75% reduction of thin spots . . . (5) production of more paper with fewer clean-ups . . . (6) reduced breaks . . . (7) improved surface characteristics . . . (8) conservation of valuable paper making material . . . (9) greatly increased water repellency.

See what this chemical substance—expressly formulated to aid formation and make paper fit to print—can do in your mill. Order enough for a trial run now.

NOPCO CHEMICAL COMPANY, Harrison, N. J.
Formerly National Oil Products Co.
Branches: BOSTON • CHICAGO • CEDARTOWN, GA. • RICHMOND, CALIF.

NOPCO KF

NOPCO TRADEMARK EVOLVED THRU RESEARCH

SUPER "BUBBLE-BUSTER"

An affiliate of the American Pulp and Paper Mill Superintendents Association

*Reg. U. S. Pat. Off.

GET "OUT OF THE RED"
...Stock control saves your $$$$$

Is lack of accurate stock control causing you serious losses through poor quality of finished product and resultant loss of sales? Are you looking ahead to the customers' demands for a better, more uniform paper? And do you know how much underweight or overweight stock is costing you in wasted tonnage? You may be losing thousands of dollars annually through consistency variations far in excess of the standards you are trying to maintain. Check at the source and learn what it is costing you in real money losses each day through varying consistencies. Then investigate the advantages, and large savings you can effect by use of the BRAMMER RECORDING CONSISTENCY REGULATOR which accurately controls consistency within 1/10th of 1%.

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COMPLETELY AIR OPERATED

BRAMMER RECORDING CONSISTENCY CONTROL

PAPER and INDUSTRIAL APPLIANCES, INC.
122 EAST 42nd STREET NEW YORK, N. Y.

MANUFACTURED AND SOLD IN CANADA BY ALEXANDER FLECK LIMITED, OTTAWA, ONTARIO.

PULP

Perkins-Goodwin Co.

ESTABLISHED 1846

30 ROCKEFELLER PLAZA • NEW YORK.

CHICAGO, ILLINOIS

LUFKIN, TEXAS

STOCKHOLM, SWEDEN

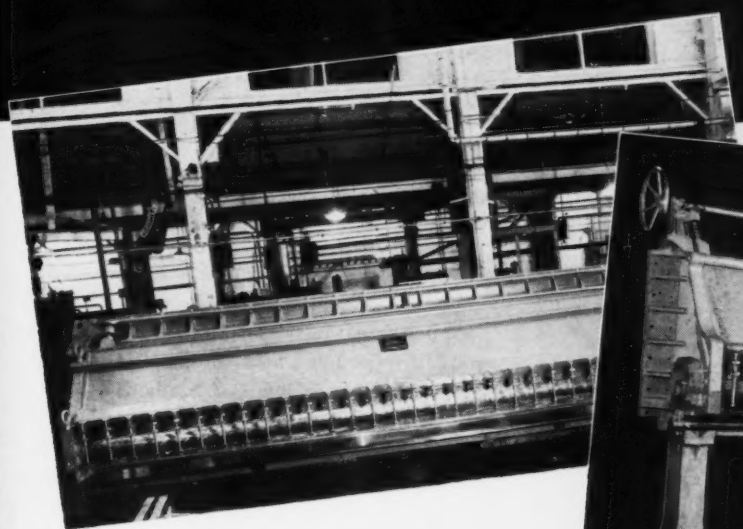
PAPER

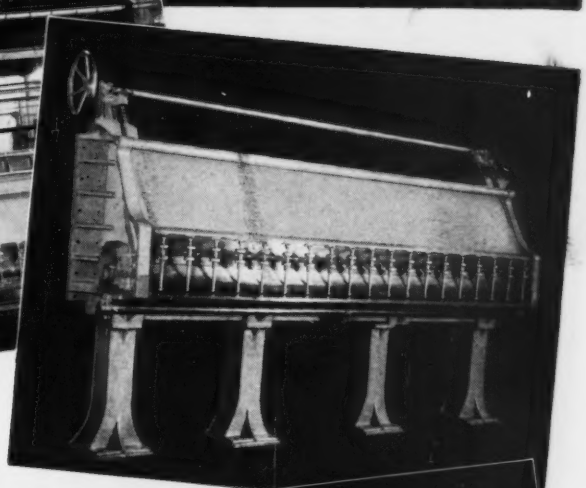
FORMATION CALIPER LEVEL SHEET INCREASED SPEED HIGHER TEST

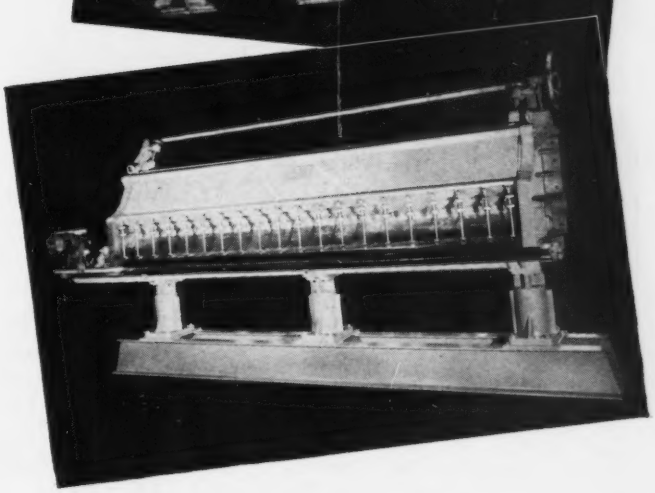
A large Book Paper Mill in Ohio purchases

9 VALLEY Inlets

Three of the nine are shown here . .







A substantial speed and production increase and a better caliper and formation uniformity were the results reported by the mill . . . . but the most significant compliment has been *repeat orders.*

You, too, can improve quality and lower costs with stock entrance equipment by . . . .

VALLEY IRON WORKS CO., Appleton, Wis.

Is *Handling* Cutting Down Your Profits?

REDUCE HANDLING COSTS with TOWMOTOR M H *

* M H is Mass Handling—the systematic movement of the most units, in the shortest time, at the lowest cost.

When excessive production costs and restricted productive output combine to cut down profits, better check your handling methods—and replace with Towmotor Mass Handling. Towmotor Fork Lift Trucks and Tractors, gasoline-powered for full-time, full-power service, provide maximum handling efficiency in any plant, large or small. You'll invest less and get more from Towmotor—always ready to lift, transport and stack materials and products of any kind . . . anywhere, any time. Operating costs? Let the men who have to make handling pay a profit show you: More *professional handlers* use Towmotor than any other fork lift truck.

You can double and triple savings on your handling operations with Towmotor Accessories, such as the Unloader illustrated. If you cannot solve your handling problem with standard Towmotor Accessories, Towmotor engineers will help you work out special equipment to meet your specific needs. Write for details.

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Representatives In All Principal Cities In U. S. and Canada

SEND FOR FREE BOOK!
You'll learn how to recognize and analyze your handling problems with the Towmotor Materials Handling Analysis Guide. Send for a free copy.

TOWMOTOR FORK LIFT TRUCKS *and* TRACTORS

RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

Interesting facts about PAPER

According to the Chinese encyclopedia, silk waste was used in paper making until 105 A.D. when T'sai Lun, famous Chinese statesman, invented a paper made from bark, hemp, rags and old fish nets.

INTERESTING FACTS ABOUT BISMARCK BROWN RX CONC. DUSTLESS

Tinctorially one of the strongest of basic colors, BISMARCK BROWN RX CONC. DUSTLESS is used extensively to produce browns, tans, and as a dulling agent for the brighter Acid, Basic and Direct colors in both sized and unsized papers. Although it does not dye bleached fibers well, its excellent solubility makes it well suited for both beater and calender coloring.

BISMARCK BROWN RX CONC. DUSTLESS is widely used in such paper applications as kraft, poster, tissue, wrapping and boxboard.

Calco

CALCO CHEMICAL DIVISION
Heller & Merz Department

AMERICAN CYANAMID COMPANY
Bound Brook, New Jersey

New York • Chicago • Boston • Philadelphia • Charlotte • Providence

A More Stable America

WASHINGTON—That a more stable American is essential to a free and stable world is the premise on which the Research and Policy Committee of the Committee for Economic Development builds its current statement on United States monetary and fiscal policy as this policy relates to the nation's overall economic stability.

The study was released on December 9 by W. Walter Williams of Seattle, CED chairman and president of Continental, Inc., and Philip D. Reed, chairman of the CED Research and Policy Committee and chairman of the board of the General Electric.

Following are the elements of the program recommended: *(1) In periods of inflation:* (a) Hold tax rates stable, so that tax revenues will rise as the national income rises and the government surplus will increase. (b) Use the government surplus to retire debt held by the commercial banking system, including the Federal Reserve banks. (c) Refund maturing government debt in a way that will reduce the holdings of the banking system. (d) Tighten the reserve position of the banks, by Federal Reserve sale of government securities in the open market, by increase of rediscount rates and/or by increase of reserve requirements. (e) Reduce the volume of government loans and guarantee of loans. *(2) In periods of depression:* (a) Hold tax rates stable, so that tax revenues will fall as the national income falls and the government surplus will decline or turn into a deficit. In extreme conditions a temporary reduction in tax rates may be desirable to stimulate private expenditures. (b) Expand the money supply and increase bank reserves by open-market purchase of government securities; further ease the reserve position of the banks by reduction of rediscount rates and/or by reduction of reserve requirements. (c) Finance the deficit, if there is one, by borrowing in a way that will induce the commercial banking system to acquire government securities, with such Federal Reserve action in providing additional bank reserves as may be necessary for this purpose. (d) Refinance maturing Federal debt in part by borrowing from the commercial banking system, including the Federal Reserve banks. (e) Expand the volume of Federal loans and guarantees of loans, within the scope of the Federal loan program accepted as appropriate in the long run.

Dryden Expansion

OTTAWA—The Dryden Paper Co. in its report for the year ended September 30, 1948, shows an increase of over 72 percent in net profits, with the profit of the year having been $682,548 compared with $396,213 in the preceding year. This represents earnings of $3.75 per share on the 182,000 common shares issued and outstanding for the company. In the preceding year, the earnings were $2.64 per share on the 150,000 outstanding. On present outstanding share capital, earnings last year would have been about $2.17 per share. Dividends paid during the year represent about 30 percent of the year's profits.

During the past year the company has spent $955,000 on new construction, much of this in connection with its new No. 4 paper machine which started production late in January and now producing at the rate of 60 tons a day. In addition, the wood preparing mill has been entirely replaced and a power line 62 miles long has been installed to connect the company's mills with Ontario Hydro. The penstock leading to No. 1 power plant has been renewed at a cost of $100,000. The bag plant of the company was moved during the year from Dryden and consolidated with that of the Woods Mfg. Co., at Winnipeg under name of Woods-Dryden Paper Bags, with the value of this investment appearing under "investment in shares of associated company, at cost" at $99,990. This company has been in production for only five months.

Canadian Power Tally

OTTAWA—Power ordinarily in use in the industry in 1947, states the Canadian Government in reporting on the pulp and paper industry for the past year, totalled 2,364,649 h.p. from 28,193 units of the following classes: 165 steam engines (42,598-hp); 121 steam turbines (175,555 hp); five diesel engines (470 hp); 18 other internal combustion engine (777 hp); 254 hydraulic turbines (573,723 hp); and 27,630 electric motors operated by purchased power (1,571,526 hp).

There were also 12,013 electric motors (477,707 hp) operated by power generated by the primary units. Equipment in reserve or idle comprised 39 steam engines (10,206 hp); 31 steam turbines (48,539 hp); nine diesel engines (2,520 hp); ten other internal combustion engines (633 hp); 12 hydraulic turbines (8,300 hp); 2,717 electric motors on purchased power (93,355 hp); and 1,001 electric motors on generated power (34,300 hp).

Canada Sees Benefits

OTTAWA, Can.—In the newly-issued official listing of commodities in which the U. S. government is now prepared to negotiate or to show its "intention to negotiate" at Geneva next spring with 11 other countries on tariff concessions, are paperboard, pulp board, cardboard, grease-proof and imitation parchment papers, wrapping papers, packing boxes, sulphite and sulphite wrapping papers, etc.; items of prime importance to Canada since these might automatically be extended as benefits to Canada under the Most Favored Nation treatment. This would mean that such Canadian products might be able to enter the United States at the new rate.

Joint Safety Conference

LOS ANGELES—The third annual Labor-Management Safety Conference of the California pulp and paper industry was held December 2-3 at Hotel Mayfair.

Participating were the Pacific Coast Ass'n., of Pulp & Paper Manufacturers, the International Brotherhood of Pulp, Sulphite & Paper Mill Workers and the International Britherhood of Paper Makers. Similar conferences were held in Washington and Oregon earlier this year.

Labor and management representatives from seven California converting and paper mills will attend the conference. Co-chairmen were John Sherman, for the mill workers, and O. R. Hartwig of Crown Zellerbach Corp.

Aussy Costs Lower

MELBOURNE, Australia — Newsprint is being manufactured in this country at £4 ($16) less a ton than the Australian price of newsprint imported from Canada, Sir Keith Murdoch told the annual meeting of Australian Newsprint Mills, Ltd., here on December 1.

Sir Keith, chairman of the company, said the concern's Tasmanian mill had produced 31,300 tons during the year, which was more than its rated capacity. The expansion of this mill would increase newsprint production by 50,000 tons a year, he added, and commented that increased imports from Canada seemed remote due to the dollar scarcity.

Canal Tonnage Climbs

OTTAWA—In a summary of canal traffic for October this year, the Canadian Government reports 26,635 tons of paper passed through the Welland Ship Canal compared with 19,916 tons in October last year and 4,376 tons of woodpulp as against 1,996 tons a year ago, with traffic in the St. Lawrence Canals involving 16,168 tons of paper and 5,931 tons of woodpulp this October compared with 10,104 and 2,795 tons respectively in the same month a year ago.

To Salvage Steel Scrap

NEW YORK—Responsibility for conducting and promoting a nationwide advertising campaign, via business papers, to salvage steel scrap from industrial sources was taken over by the Advertising Council's business paper advisory committee at a meeting in Hotel Pierre on December 3. The campaign was requested of the Advertising Council by the Department of Commerce.

Beware 1201 and 480

NEW YORK—Counterfeit $10 and $20 bills were reported on December 3 to be flooding the New York area. The bogus $10 bill bears back plate number 1201; the $20 bill, back plate number 480. The faces of the bills bear a "G." Source of the paper stock on which they were printed is a mystery.

PAPER MILL ROLLS
and MACHINERY

Union manufactures a wide variety of products for the paper industry. A large part of its business is making rolls for the paper machine. Other equipment and machines for the paper industry are built to special design.

SEND FOR BULLETIN 1048-J

UNION MACHINE COMPANY
FITCHBURG, MASSACHUSETTS

Observing Yankee Methods

MIDDLETOWN, Ohio — James H. Dutroc of Besancon, Novillars, France, is on a visit of some eight to ten months as an observer at the Shartle Bros. Machine Co., here, to become familiar with American paper mill machinery. Mr. Dutruc grew up in a paper-making environment, his father being technical manager of the French mill, Papeteries J. B. Weibel. After two years of work in the Weibel paper and bag plant, Mr. Dutruc studied chemistry and zoology at the University of Besancon. During 1945, he served in the French air force. Then he spent a year as draftsman for Neyret Beylier, a French machinery constructor, after which he returned to Papeteries J. B. Weibel as a designer. In this connection, he set up a sulphite pulp laboratory being erected by the Weibel company.

Continental Plant Lease

TONAWANDA, N. Y.—The new plant of the Continental Can Co., Inc., at Brighton road and Calvin avenue, has been purchased by the New York Life Insurance Co. Simultaneously, Continental Can has leased the premises on a long-term net rental basis. This is the fourth property purchased by the New York Life and leased to Continental Can under an agreement made in 1946. The purchase price was not disclosed. The plant, costing upwards of $1,000,000, is practically completed and is being made ready for the production of fiber containers. It contains 200,000 square feet of space and is on a 40-acre site.

Marathon Modernization

MARATHON, Ont.—Marathon Paper Mills of Canada, Ltd., 320 Bay street, Toronto; H. P. Klinestiver, Canadian manager, Public Utilities Bldg., Port Arthur, Ont., and Arthur J. Stevens, president, Rothschild, Wis., are contemplating a $1,500,000 modernization program for 1949 to include sulphite mill improvements, housing, staff house extension and development of its woodland mechanization program have been let on staff house extension, which is now under way by the Foundation Co. of Ontario, Ltd., Toronto.

Nash Succeeding Johnson

MIDDLETOWN, Ohio—Harry C. Johnson has tendered his resignation as vice-president and director of sales of the Sorg Paper Co., to be effective January 15, at which time Roy A. Nash will assume his duties with the company as vice-president in charge of sales, Donald G. Driscoll, president, divulges.

"Collector's" Item

BERLIN—The local black market has popped up with another scarce and hard-to-get item—the new Berlin telephone directory.

To get a directory through official channels, a telephone subscriber has to turn in 16 pounds of old paper. Black marketeers are offering them for 100 marks (Russian) per copy without the paper trade-in. At the 30-cent exchange rate, that's $30.

The Western Berlin press blames Communists in the city administration for diverting the new directory — the second printed since the war — into illegal channels for private profit.

Heating, Ventilating Expo

CHICAGO — Advances in air conditioning will be shown at the 9th International Heating & Ventilating Exposition, at the Amphitheatre, January 24-28, when more than 300 manufacturers will exhibit under the auspices of the American Society of Heating & Ventilating Engineers, whose 55th annual meeting will be held the same week.

The exposition is under the management of International Exposition Co., Charles F. Roth, manager; E. K. Stevens, associate manager. Permanent headquarters at Grand Central Palace, New York.

See Your Firemen, First

HOUSATONIC, Mass.—The presence of the local fire apparatus and firemen at the Rising Paper Co., of a recent mid-November evening was not because of a fire, but for business reasons. When the firemen extinguished a blaze in the plant a few months ago, Fred May, general manager, presented the fire company a $200 check and invited the firemen to visit the plant to become acquainted with the property. The invitation was accepted and the firemen investigated all possibilities of fire fighting as they were escorted throughout the premises.

Mosher Leaving Marvellum

HOLYOKE, Mass.—Robert H. Mosher, technical director of the Marvellum Co., is leaving that organization to join the Holyoke Card & Paper Co., of Springfield. In his new position, Mr. Mosher will be responsible for research and development and for directing and coordinating the efforts of the technical and purchasing departments with the manufacturing department. Emphasis wil be placed on the development of new products and processes and in the improvement of existing facilities.

PRSA Re-Elects Trenholm

OTTAWA — Canadian representation on the directorate of the Public Relations Society of America has been increased with the re-election of Lee Trenholm, director of public relations and advertising for the Provincial Paper Co., Toronto, as vice-president as well as by the addition of two other Canadians to the board of directors of the organization.

Smith Ups Haggerty

LEE, Mass. — Claude M. Haggerty has been named assistant general manager of the Smith Paper, Inc. He joined the company in 1919.

Colson in Venezuela

CARACAS, Venezuela — George H. Colson arrived here on November 21 to become superintendent of two paper mills of Cia Anonimo Industrial de Carton. Previously he was superintendent of the Gill division of the American Writing Paper Corp., Holyoke, Mass. Before going to Holyoke two years ago, Mr. Colson was specialties superintendent of the Pacific Mills in British Columbia, and before that worked in plants in England and in India.

St. Helens Modernizing

ST. HELENS, Ore. — A $1,500,000 modernization and repair program is under way at the St. Helens Pulp & Paper Co., plant here, Max Oberdorfer, president, discloses. Aim of the program is to make the 23-year-old plant —largest industry in Columbia county —modern in all respects. An additional 500 feet of railroad spur track already has been constructed to facilitate unloading of pulpwood.

Aid Emergency Fund

VANCOUVER, B.C.—Staff campaigns have been started by pulp and paper firms in British Columbia, in co-operation with the United Emergency Fund for Britain. Food will be shipped to the United Kingdom as a result of campaigns which have been started by B. C. Pulp & Paper Co., Ltd., Woodfibre and Port Alice; Pacific Mills Ltd., Ocean Falls and Powell River Co. Ltd., Power River.

New Fayetteville Firm

FAYETTEVILLE, N. C. — The Mid-South Paper Co., an affiliate of the Hubbs & Howe Co., has leased the Well's cotton warehouse building on Worth street and began operations on December 1. John T. Alexander is general manager. The new firm is moving here from Aberdeen and will distribute paper and paper products over a radius of 50 miles around Fayetteville.

Crown Zellerbach Corp.

SAN FRANCISCO—Crown Zellerbach Corp., reports for the six months ended October 31, net income of $10,266,039, or $3.29 a share, on 2,851,976 common shares outstanding, against $9,567,899, or $3.40 a share, for the like 1947 period on 2,527,273 shares outstanding. Net sales for the six months ended September 30, amounted to $85,049,716, against $74,211,648 for the corresponding 1947 period.

McCreary Succeeds Stroup

NEW YORK—Melvin L. McCreary has been named manager of the Williamsburg, Pa., plant of West Virginia Pulp & Paper Co., succeeding H. Drew Stroup, who recently resigned as plant manager after nearly five years' service in that capacity. Mr. Stroup will continue with the company as a consultant.

If you want MORE LIFE from your tubing applications . . .

put it up to headquarters!

• Paper mill engineers have found an easy way to get longer service out of tubing. Simply by following the advice of our tubing specialists they have been able to double or even triple the life of their evaporator, condenser and heat exchanger tubing, and similar services. All that was needed was a change-over to a grade of steel more suitable to the conditions of the job.

There are two reasons why we at Tubing Headquarters can definitely help you to obtain better results from tubing applications – why it will pay you to put your tubing problems in our hands.

First, because NATIONAL Tube Company makes seamless steel tubing in the widest range of size and wall thickness and in a complete range of steel grades –from low carbon to the finest alloy and stainless steel–able to take care of practically any paper mill requirement. And, second, because we never lose sight of the fact that every installation is an individual problem in material selection and must be treated as such.

As a result our recommendations are based solely on the particular requirements your service involves. In other words, we fit the tubing to the job, not the job to the tubing.

If you want that kind of approach to your tubing problems, bring them to us.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
(TUBING SPECIALTIES DIVISION)
COLUMBIA STEEL COMPANY, SAN FRANCISCO
PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

WHICH TO USE? Low Carbon Steel may be most economical for many applications, but wherever corrosion is a problem one of the various alloy steel or stainless steel tubes may pay handsome dividends in longer life and lower maintenance. Let us help you make the proper choice.

SEAMLESS means "Walls Without Welds"–pierced from solid steel of the finest quality. NATIONAL tubes made by this process have absolutely uniform wall strength – no longitudinal line of potential weakness.

USS

NATIONAL WALLS WITHOUT WELDS Seamless

PIPE AND TUBES

UNITED STATES STEEL

Pulp, Paper, and Board Production, 1947

Source: Bureau of the Census, Industry Division, Paper and Printing Unit

WASHINGTON — *Paper and Board Production*—The production of paper and board in the United States was 21,102,000 tons in 1947, the Bureau of the Census reported today in a preliminary release in the 1947 Census of Manufactures series. This output is, by a substantial margin, the highest record in the industry's history.

The largest tonnage increase between 1939 and 1947 was in paperboard which reached a total of 9,187,000 tons, 55 percent above the 1939 reported output. There were 10,647,000 tons of paper produced during 1947, an increase of 44 percent over the same period. An exact comparison is not possible in building boards and wet machine boards because certain products in this field were classified differently in 1939. (See reverse for detailed statistics.)

Comprehensive data on employment, payrolls, cost of materials, production and value of shipments by grades, etc., will appear in the 1947 Census of Manufactures bulletin covering the pulp, paper and board industry, to be published early next spring.

Pulp Production—An all-time record was also established in wood pulp in 1947 when production reached 11,946,000 tons, 71 percent greater than the 1939 record. The largest tonnage and percentage increase was in sulphate pulp which reached a total of 5,357,000 tons, 45 percent of all pulp manufactured. The output of soda pulp showed but 11 percent increase over the 1939 figure, but sulphite and groundwood pulps exceeded the 1939 figures by 44 and 42 percent, respectively. A similar comparison of the other pulps is not possible because the 1939 record is not complete. Other wood pulps amounted to 10 percent of the total wood pulp output in 1947 reflecting a considerable increase in importance of these pulps in recent years.

In addition, 160,000 tons of pulp other than wood pulp were produced for sale in 1947, an amount which exceeded the 1939 record of 98,000 tons by 63 percent. Of these pulps, 150,000 tons were cotton linter and cotton pulp, and the balance was rag pulp and deinked waste paper.

Productive Capacity—The maximum annual capacity for making paper and board amounted to 22,874,000 tons at the end of 1947, 6,317,000 tons more than that recorded for 1939. These figures are not exactly comparable because the 1939 record was computed by multiplying reported daily capacity by 310 days, assuming a 6-day operating week throughout the industry. The 1947 capacity is based upon the actual running schedule of each mill, which averaged 322 days. In wood pulp, capacity increased from 9,000,000 tons (310 working day basis in 1939) to 13,135,000 tons in 1947 (average working day basis 335 days). In both pulp and paper, the increases between 1939 and 1947 in capacity are closely related generally to the increases in output.

Operating Rates—The operating rate in paper and board, i.e., production divided by capacity, was 92 percent in 1947, as compared with 82 percent in 1939. In 1947 both wet machine board andb uilding board fell below the average figure, while paper and paperboard were above.

The over-all operating rate in wood pulp was 91 percent of capacity in 1947. Only groundwood pulp was below this figure. The highest rate was in sulphite pulp, in which capacity expansion was small during the year.

Material Consumption — The wood pulp industry consumed 19,339,000 cords of pulpwood (in the condition in which it was received at the mill), and the paper and board industry used 13,285,000 tons of wood pulp and 9,498,000 tons of other fibrous materials in 1947. These figures are substantially greater than any previous record.

Consumption of Pulpwood, Wood Pulp, and Other Fibrous Materials in the Manufacture of Pulp, Paper, and Board in 1939 and 1947.

(All figures in thousands)

Kind	Unit of Measure	Year 1939[1]	Year 1947	Per Cent Increase over 1939
Pulpwood (as received at mill)	Cords	10,816	19,339	79
Wood pulp	Tons	8,650	13,285	54
Fibrous materials other than wood pulp	Tons	5,527	9,498	72

[1] Does not include data on the use of materials for the companies referred to in footnote 2, table 1.

Canadian Carloadings

OTTAWA—Car loadings on the Canadian railways from the first week of 1948 until the week ending November 27 dropped to a cumulative total of 204,798 cars of woodpulp and paper compared with 198,303 cars in the similar period a year ago ending week of November 29, the latest report of the Canadian Government discloses, showing that in the Eastern Division such carl loadings amounted to 177,217 cars in this period of 1948 as against 172,339 cars a year ago and in the Western Division rose to 27,581 cars compared with 25,964 cars last year in this period.

Asks Cardless Yule

PRAGUE, CZECHOSLOVAKIA — The Communist Cabinet figures Czechoslovaks ought to forget about buying Christmas cards this year. This was suggested by Vaclav Kopecky, Information Minister. The Cabinet agreed. Kopecky said that the public should turn over the money saved to a fund to publish the works of Alois Jirasek, a national writer, who died in 1930.

Output and Production Capacity of Paper, Board and Pulp in 1939 and 1947

(Quantities in thousands of tons of 2,000 pounds)

Kind	Production 1939	Production 1947	Capacity as of December 31[1] 1939	Capacity as of December 31[1] 1947	Rate of operation 1939	Rate of operation 1947
Paper and board, total	13,510	21,102	16,557	22,874	82	92
Paper	7,405	10,647	8,926	11,489	83	93
Paperboard	5,937	9,187		9,942		92
Wet machine board	[2]54	150	7,631	168	80	89
Building board	[2]114	1,118		1,275		88
Wood pulp, total	6,993	11,946	9,000	13,135	78	91
Sulphite	1,946	2,796	2,525	2,955	77	95
Sulphate	2,963	5,357	3,369	5,837	88	92
Soda	441	491	562	526	78	93
Groundwood	[3]1,445	2,050	2,123	2,450	68	84
All other	[3]198	1,252	421	1,367	47	91
Pulp, other than wood pulp (produced for sale)	98	160	.....	.....	..	..

[1] 1939 capacities based on 310 days operation; 1947 capacities based on an over-all average of 322 days operation in paper and board and 335 days in wood pulp.

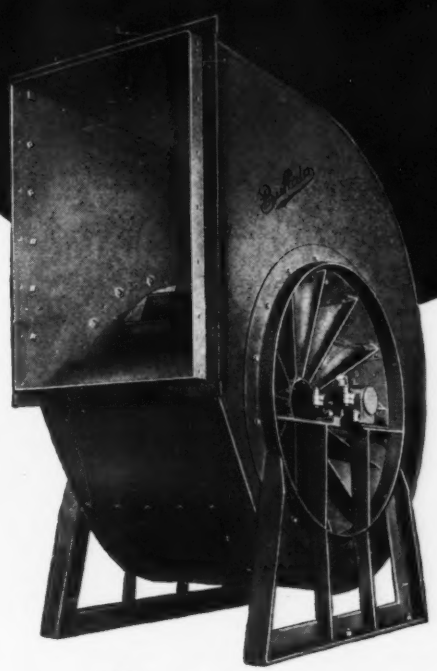
[2] Does not include the production for 1939 of some companies, for which comparable production detail is not available.

[3] Does not include the pulp produced by the 12 building board companies covered by footnote 2.

OAKITE SALES HEAD

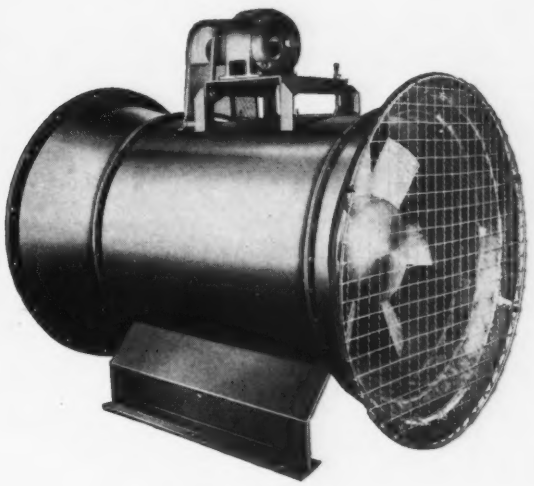
Frank L. Oldroyd has been named sales manager of the industrial division of Oakite Products, Inc., New York City. . . . He has been with the firm for 15 years.

This Fan Selection GIVES YOU PEAK PERFORMANCE



"Buffalo" LIMIT-LOAD FANS

FOR BEST results in your air handling problem, you need *more* than a well-engineered, well-constructed fan. It's just as important to have a fan *designed for that job!* That's why "Buffalo" builds so many types. For example, the "Buffalo" Limit-Load Fan is ideal for high-volume, low-pressure ventilation—especially where bad duct connections (elbows near inlet, etc.), are encountered. Directional inlet vanes, perfectly balanced rotor and improved housing scroll design make for exceptional air delivery at low costs in these sturdy fans. *"Buffalo" representatives in principal cities can give you unbiased advice on the fan to serve you best!*



"Buffalo" AXIAL FLOW FANS

BOTH types are popular, proven and efficient. Certain conditions, however, definitely call for Axial Flows. These are ideal for *straight* duct connections—since they derive their quiet, turbulence-free air delivery from their "beeline" design. As a "booster" for an existing system—or a single unit for low-cost ventilation of mine, ship or factory—in food cooling—industrial exhausting—diesel cooling—many other installations, duct-connected or not—it will pay you to check into "Buffalo" Axial Flow Fans. *Write us about your air problem!*

BUFFALO FORGE COMPANY

159 Mortmer Street Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Branch Offices in All Principal Cities

"Buffalo" FANS for EVERY APPLICATION

Trends

(Continued from page 37)

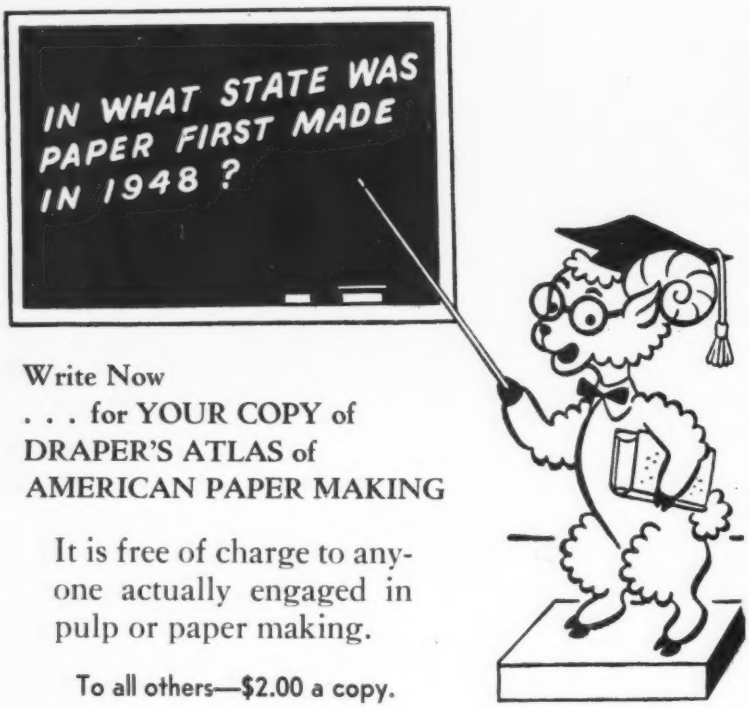
lations will continue because of the dollar shortage. Australia has dollars for only 45,000 long tons of newsprint annually, and her newspapers are able to keep eight pages daily only by "the uncertain supply from hardwood forests," Sir Keith Murdock, publisher, stated while negotiating in Vancouver for purchase of newsprint. Speaking again before the annual meeting of Australian Newsprint Mills, Ltd., Sir Keith said that increased imports seem remote because of the dollar scarcity. He stated that the concern's Tasmanian mill had produced 31,300 tons during the year, more than its rated capacity, and at $16 less a ton than the Australian price of newsprint imported from Canada. Expansion of the mill would increase newsprint production by 50,000 tons a year, he said.

Power Shortages

Some improvement is noted in the Ontario electric power situation. During the week ended December 4, four power quota increases restoring earlier cuts were announced. City of Toronto ended all power cutoffs for the balance of December. The ANPA bulletin reports that a significant reduction in total newsprint produced is not expected to result from the power shortage, only as it may affect certain producers.

Customers of St. Lawrence newsprint have been advised that unless the power curtailment becomes more drastic, it is not believed necessary to cut the December supply. Power reduction of 10 percent is still effective at the Three Rivers, Que., mill of St. Lawrence, and a further cut is expected at the Dolbeau mill. Curtailment of power in Quebec may be effective until the spring thaws, it is estimated.

What do you know about Paper?



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AMERICAN PAPER MAKING

It is free of charge to anyone actually engaged in pulp or paper making.

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DRAPER BROTHERS COMPANY
Woolen Manufacturers Since 1856
CANTON, MASSACHUSETTS

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BRADFORD WEST, Pittsfield, Mass. — WILLIAM N. CONNOR, Jr., Canton, Mass. — L. H. BREYFOGLE, Kalamazoo, Mich.
WALTER A. SALMONSON, 519-20 White Bldg., Seattle, Wash. — L. L. GRIFFITHS, Jr., Kalamazoo, Mich.

Answer to Question No. 12 — Arizona

Indexes

Index of general business activity for the week ended December 4 climbed to 155.8 from 151.5 in the preceding week, compared with 155.4 in the corresponding week of 1947.

Index of paperboard production fell to 195.2 from 209.4 in the preceding week, compared with 183.7 in the corresponding week of 1947.

Comparative ratios of U.S. paper and paperboard production to mill capacity, as reported by AP&PA are:

	Dec. 4 1948	Nov. 27 1948	Dec. 6 1947	Dec. 7 1946	Dec. 8 1945
Paper**	96.3	‡93.0	112.1	106.6	99.0
Paperboard ...	93.0	89.0	98.0	99.0	97.0

** Indicates 1948 volume of 173,456 tons. Comparable week, 1947, 177,659 tons. ‡ Revised.

Paperboard Production (Tons)

	Dec. 4 1948	Nov. 27 1948	Dec. 6 1947
Production	190,868	183,311	179,582
New Orders	218,071	150,890	229,231
Unfilled Orders ...	362,854	338,720	466,428

Percent of Activity, Current 93%; Year, 96%.

1,427 Feet Per Minute

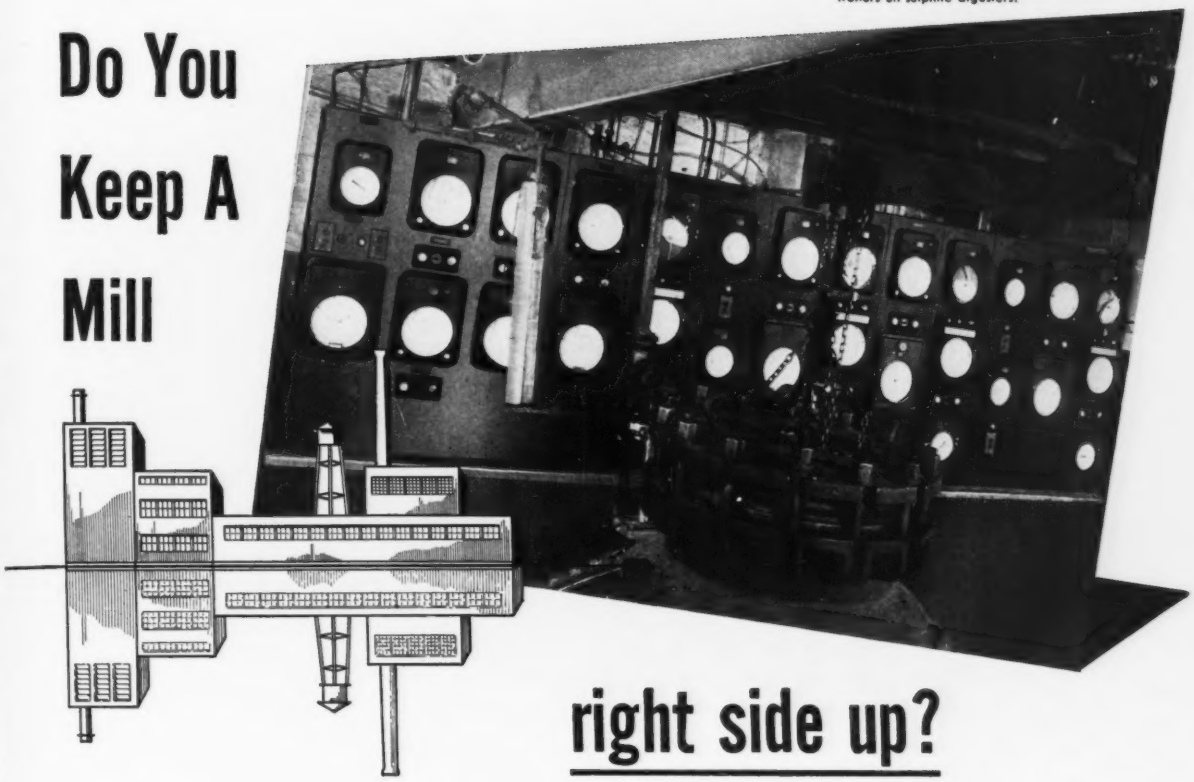
FORT WILLIAM—A world record for paper production in a 24-hour period is believed to have been established on December 8 by the Great Lakes Paper Co., Ltd., when the plant produced 262½ tons of newsprint, company officials reported. The previous record, 261 tons in one day, was held by the Baie Comeau, Que., mill, they said. The run was made at a rate of 1,427 feet of paper a minute and raced along with only one break in the 24-hour stretch.

Awarded $224,207.20

NEW YORK—After more than seven years of litigation the case of the Rondout Paper Mills, Inc., of Napanoch, town of Wawarsing, Ulster county, vs. the City of New York has been terminated with the City of New York paying $224,207.20 to the claimant.

The proceedings arose out of the taking by the city of waters of Rondout Creek at the site of the property of the Rondout Paper Mills.

How Do You Keep A Mill



Automatic control system showing Bristol's Time-Temperature and Pressure Controllers on sulphite digesters.

right side up?

Answer: by putting all the variables—temperature, flow, level, consistency, pressure, time, and pH value—under the unfailing observation and control of Bristol instruments.

Below are some of the instruments designed by Bristol for pulp and paper mill applications. Have us send you information about the Bristol indicating, recording and automatic controlling instruments which will help put *your* particular operations on a firm footing for more uniform quality and lower-cost production.

DIGESTER ROOM
- Time-Temperature Control
- Time-Pressure Control
- Relief Control
- Steam Flow Record and Control

PULP WASHERS
- Blow Tank Consistency
- Stock Flow Control
- Tank Level Control
- Shower Flowmeters

RECOVERY PLANT
- Black Liquor Flow
- Green Liquor Baume Control
- Dissolving Tank Level Control
- Liquor Storage Level

EVAPORATORS
- Liquor Flow Control
- Steam Pressure Control
- Temperature Recorders
- Steam Flow

CAUSTICIZING PLANT
- Green Liquor Flow Control
- Heater Temperature Control
- Tank Level Recorders

LIME KILN
- Hot End Temperature Control
- Draft Control
- Oil Flow Record

THE BRISTOL COMPANY, 148 Bristol Road, Waterbury 91, Conn. (The Bristol Co. of Canada Ltd., Toronto, Ontario, Bristol's Instrument Co. Ltd., London N. W. 10, England) West Coast: Branch Factory—40 Berry St., San Francisco 7, Cal. Branch Office—White Building, Seattle 1, Washington. Lake Region: Branch Factory & Office—351 East Ohio St., Chicago 11, Ill. Southern States: Branch Office—Comer Building, Birmingham 3, Alabama.

Immediate Delivery—Bristol has hundreds of Recording and Controlling Instruments as well as Pyrometers and Thermocouples in stock for immediate delivery. Send for Bulletin W1811, Stock Instruments and P1235, Thermocouples and Pyrometer Accessories.

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...REDUCES CHEMICAL STORAGE PROBLEMS IN INDUSTRIAL OR MUNICIPAL WATER TREATMENT PLANTS

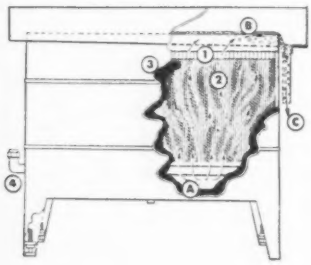
"Right!

69 lbs. of aluminum treats as much water as nearly 3/4 ton of coagulants"

By employing the principle of low voltage, DC, electrolytic dissolution of aluminum plates in water, the Alhydro Floc Producer greatly reduces the necessity for protecting and storing bulky chemicals. In addition, the Alhydro Floc Producer easily provides the simplest and most foolproof answer to the problem of removing color and suspended matter from process or drinking water. It produces a readily controllable concentration of remarkably stable floc . . . even under water conditions so adverse that floc formation would be impossible with older methods.

One Alhydro Floc Producer will treat an average of 300,000 gallons of water per day . . . but the units can be used singly or in multiples in present or proposed water treatment plants.

SKILLFUL ENGINEERING OF THE ALHYDRO FLOC PRODUCER
gives simplicity of operation . . . ease of maintenance



1. Connector Bar on each side of tank
2. Alternate Stainless Steel and Aluminum Plates.
3. Composition rubber lined stainless steel tank
4. Water Feed Line easily removed for inspection

A. Water enters tank through slots in feed pipe.
B. Concentrated floc is carried to the top and leaves through discharge trough.
C. Discharge pipe feeds floc to raw water.

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Read this folder which illustrates and describes the advantages of the compact Alhydro Floc Producer. See how you can simplify the treatment of drinking water or water for industrial use. Write for your free copy today.

ALHYDRO, INC. DEPARTMENT 12C 516 N. CHARLES ST., BALTIMORE 1, MD.

Letters

Dear Sir:

For many years we have used various price quotations from your magazine and incorporated several of them into a paper and pulp index which we compile weekly and monthly.

Two of the items which have been listed for some time we are now unable to find, and wonder if you could give us some explanation or advise us to switch to some other classification. The items in question are Single Manila Lined Chipboard, per ton, New York, and Plain News Board. The last available quotations we have had for these items were $102.50 to $100.00 and $92.50 respectively.

Can you please advise us if these items are discontinued permanently from your price table, or are they only temporarily missing due to lack of quotations?

We would appreciate any help you could give us in this matter.

NORMAN F. REED
Research Department
McGill Commodity Service
Auburndale, Mass.

These items were dropped about August 16 because Single Manila Lined Chip does not appear to be considered by the paperboard industry as a volume item. Mill representatives suggested that the listing of Bleached Manila Lined Chip would be of more value.

Gentlemen:

In your Paper Trade Journal of November 4th, of this year, on Page 24, you have quoted under Old Domestic Cotton Rags from New York vicinity, No. 2 Whites miscellaneous at $2.75 and $3.00 per 100 lbs. On Page 26 under Domestic Rags Old, F.O.B. Boston, you have quoted No. 2 Whites miscellaneous at $2.00 per C. Also quoted are twos and Blues repacked at $1.25 per C.

We have been unable to locate from our present supplier who is or are offering these prices.

We would appreciate it very much if you could send us any information you have as to the source or sources that you have obtained these prices.

Thanking you, we are

J. M. TAYLOR, JR.,
Purchasing Agent
Taylor Fibre Co.,
Norristown, Pa.

Price and market information supplied us is necessarily confidential, so that Paper Trade Journal is unable to comply with this request.

Army, Navy Bids Awards

NEW YORK—Invitations to Bid have been issued by the New York Navy Purchasing Office, 111 E. Sixteenth Street, New York City, on the following items:

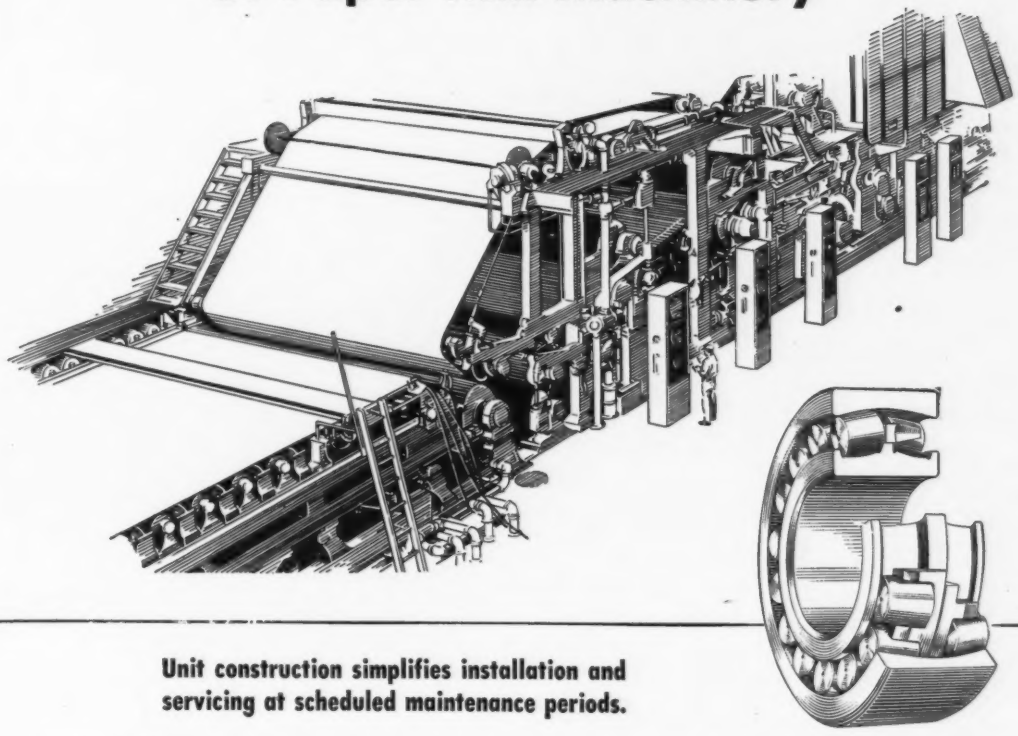
Invitation No. 3829—Bristolboard, Manila, Cream color-postcard—83,000 sheets. Bids will be opened 22 Dec. 1948 at the New York office. Delivery: Jan., March, June 1949 for various destinations.

Invitation No. 3875—Paper, Index chemical wood bristol, single-ply, rosin-size. White—75,000 sheets. Bids will be opened 14 Dec. 1948 at the New York office. Delivery: 2 weeks from date of contract to the Supply Officer In Charge, Great Lakes, Ill. (Naval Supply Depot).

Invitation No. 3616—Paper, Bond, chemical,

(Continued on page 78)

Torrington Spherical Roller Bearings ...For Dependable All-'round Performance Of Paper Mill Machinery



Unit construction simplifies installation and servicing at scheduled maintenance periods.

When Torrington Spherical Roller Bearings are used in calender stacks, screens, dryers, chippers, beaters and other paper mill machinery, you are assured of precision operation, long service and low maintenance costs.

The reasons? Consider these:

... The self-aligning feature allows the bearing freedom to adjust to shaft deflection or misalignment under maximum load conditions.

... The low friction coefficient and precision tolerances of Torrington Spherical Roller Bearings assure smooth starting and running—in the most exacting applications.

... Construction of the bearing assures axial stability of shafts, for proper meshing of gears and drives with end play eliminated.

... Positive sealing reduces danger of spoilage of material through oil leakage.

Whatever your requirements—whether you design, manufacture or operate paper machinery—Torrington engineers will be glad to help you with any bearing problems. Their many years of specialized experience in the design, construction and application of all major types of anti-friction bearings is yours without cost or obligation. Call or write your nearest Torrington office.

THE TORRINGTON COMPANY
South Bend 21, Ind. • Torrington, Conn.
District Offices and Distributors in Principal Cities

TORRINGTON *SPHERICAL ROLLER* **BEARINGS**

SPHERICAL ROLLER • TAPERED ROLLER • STRAIGHT ROLLER • NEEDLE • BALL • NEEDLE ROLLERS

Army, Navy Bids, Awards

(Continued from page 76)

wood, tubsized, various colors—37,180 reams. Bids will be opened 23 Dec. 1948 at the New York office. Delivery: 60 days for various destinations.

Awards have been made by the Navy Purchasing Office, on the following items:

Invitation No. 3583—Containers, Fibre-board. To: Arch Bill Corrugated Products Corp., Brooklyn, N. Y.—55,000 ea. at $305.00 per M.

Awards have been made by the New York Quartermaster Purchasing Office, 111 East Sixteenth Street, New York City, as follows:

QM-30-280-49-462 covering Paper, Duplicator, Mimeograph and Typewriter, to:

Walker-Goulard-Plehn, New York 7, N. Y.—9,300 reams (various types) @ $.537 to $1.854.

Standard Business Machines, New York, N. Y.—5,000 reams @ $1.01 to $1.19.

Oregon Pulp & Paper Co., Portland, Ore.—10,100 reams (various types) @ $.5105 to $1.943.

Pulp & Paper Trading Co., New York 16, N. Y.—8,700 reams @ $.480 to $.617.

Eastern Corp., Bangor, Maine—3,300 reams @ $1.80.

Everett Pulp & Paper Co., Everett, Wash.—4,000 reams @ $.53 to $1.90.

W. C. Hamilton & Sons, Montgomery County, Pa.—3,000 reams @ $1.921 to $1.929.

Grays Harbor Pulp & Paper Co., Hoquiam, Wash.—5,100 reams @ $1.8870 to $1.8940.

Above procurement is for the U. S. Army.

AMERICAN PAPER AND PULP ASSOCIATION'S PRODUCTION RATIO REPORT*

(Production as per cent of six-day capacity)

COMPARATIVE WEEKLY SUMMARIES

Current Weeks—1948		Corresponding Weeks—1947	
October 30	99.3	November 1	111.1
November 6	97.0	November 8	108.9
November 13	99.6	November 15	109.1
November 20	99.4	November 22	111.9
November 27 (Revised)	93.0	November 29	107.4
December 4	**96.3	December 6	112.1

COMPARATIVE MONTHLY SUMMARIES

1947						1948	
Jan.	102.1	May	106.2	Oct.	109.5	Jan.	100.3
Feb.	105.9	June	106.2	Nov.	109.3	Feb.	99.8
Mar.	106.1	July	95.5	Dec.	101.5	Mar.	100.8
Apr.	105.1	Aug.	104.2			Apr.	100.8
		Sept.	102.0	Year Avg.	104.3	May	100.5
						June	95.7
						July	‡88.1
						Aug.	‡96.8
						Sept.	‡91.8
						Oct.	‡99.1

‡ Preliminary Ratios.

COMPARATIVE YEARLY SUMMARIES

	1941	1942	1943	1944	1945	1946	1947	1948
Year to Date	97.4	91.3	88.5	88.7	89.8	101.6	104.6	97.1
Year Average	97.4	90.4	87.8	88.1	89.4	101.1	104.3	

** Indicates 1948 volume of 173,456 tons—Comparable week 1947—177,659 tons.

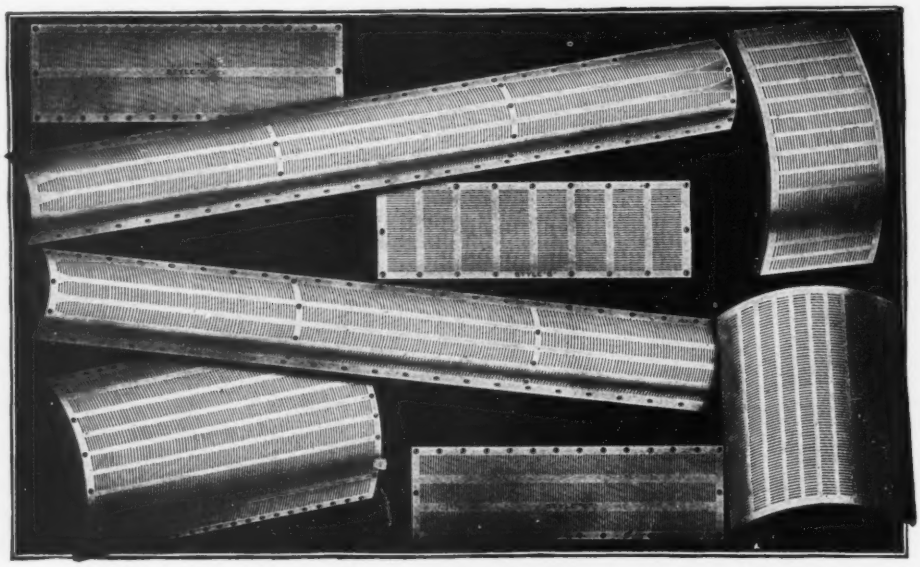
PAPERBOARD OPERATING RATIOS†

Current Weeks—1948		Corresponding Weeks—1947	
October 30	96	November 1	100
November 6	95	November 8	102
November 13	96	November 15	101
November 20	97	November 22	102
November 27	89	November 29	100
December 4	93	December 6	98

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1947	99	103	101	100	101	101	90	99	96	101	99	89	98
1948	99	100	102	102	100	94	81	92	91	96	94		

* Based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint exclusively.

† Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association.



"HARDY" BRONZE and CHROME-NICKEL-STEEL SCREEN PLATES.

MAGNUS METAL CORP. FITCHBURG, MASS.

We Span the Seven Seas —FOR YOU!

The organization of Elof Hansson maintains offices in:

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Bombay
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and representatives in all key cities throughout the world!

Distance is No Barrier to Us!

Elof Hansson, Inc., as importers and exporters of paper and woodpulp, has kept pace with the times. Through our round-the-globe organization, with offices in nine key cities, we are prepared to expedite the purchase and sale of all types of paper and woodpulp. Our quick, efficient methods of bringing buyer and seller together insures substantial profits for both.

ELOF HANSSON, INC.

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MATERIAL HANDLING *News*

CLARK

a BIGGER exhibit of BETTER machines TO DO MORE WORK AT LOWER COST

—the Third National Materials Handling Exposition

The 1949 Exposition will be held in Philadelphia January 10 through 14 and will constitute a broad view and preview of "industrial history in the making." It will be the most convincing demonstration of all time that the Science of Materials Handling is eternally new—that it is a never-ending process of evolving new and better methods and equipment to the end that our National economy can shake off the shackles of old, inefficient and time-consuming practices which have become prohibitively costly both in human energy and in dollars.

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REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD
AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

Obituary

Reginald A. Baker, 51, purchasing agent of the Powell River Co. and the past-president of the B. C. Purchasing Agents Assn., died in General Hospital at Vancouver, B. C., on December 1. Born in Sheffield, Eng., Mr. Baker came to Canada in 1911, returning overseas again in World War I as a member of the original Seaforths. He joined the Powell River Co. in 1922. Surviving Mr. Baker are his widow, his mother and a brother, Harry, in Vancouver.

J. Med Williams, 64, assistant superintendent of pulp production at the Canton, N. C., plant of the Champion Paper & Fibre Co., died December 7 following a paralytic stroke. The oldest active employe in point of service with the Canton division, Mr. Williams was associated with Champion since 1905. Surviving him are his widow, Mrs. Vesta Sutherland Williams; two sons, Norman and Carl; three brothers, Wylie, Jeter and Ben; and a sister, Mrs. J. L. West.

Eldon M. Eckhart, 52, executive vice-president of the J. M. Huber Corp., New York, producer of carbon black, printing inks, oil and gas, and kaolin clay, died suddenly on November 28 at his home in Amarillo, Texas. Mr. Eckhart was in charge of Huber's carbon black and oil and gas operations with headquarters at Borger, Texas.

George P. Haberstein, 41 years old, eastern sales manager for the multiwall bag division of the St. Regis Sales Corp., subsidiary of the St. Regis Paper Company at 230 Park Avenue, New York, died at his home in Mt. Vernon, on December 9. Mr. Haberstein had been under medical care for several weeks.

Sam Fishman, 68, retired founder and head of the Mound City Paper Co., St. Louis, died of heart disease at Jewish Hospital on November 25.

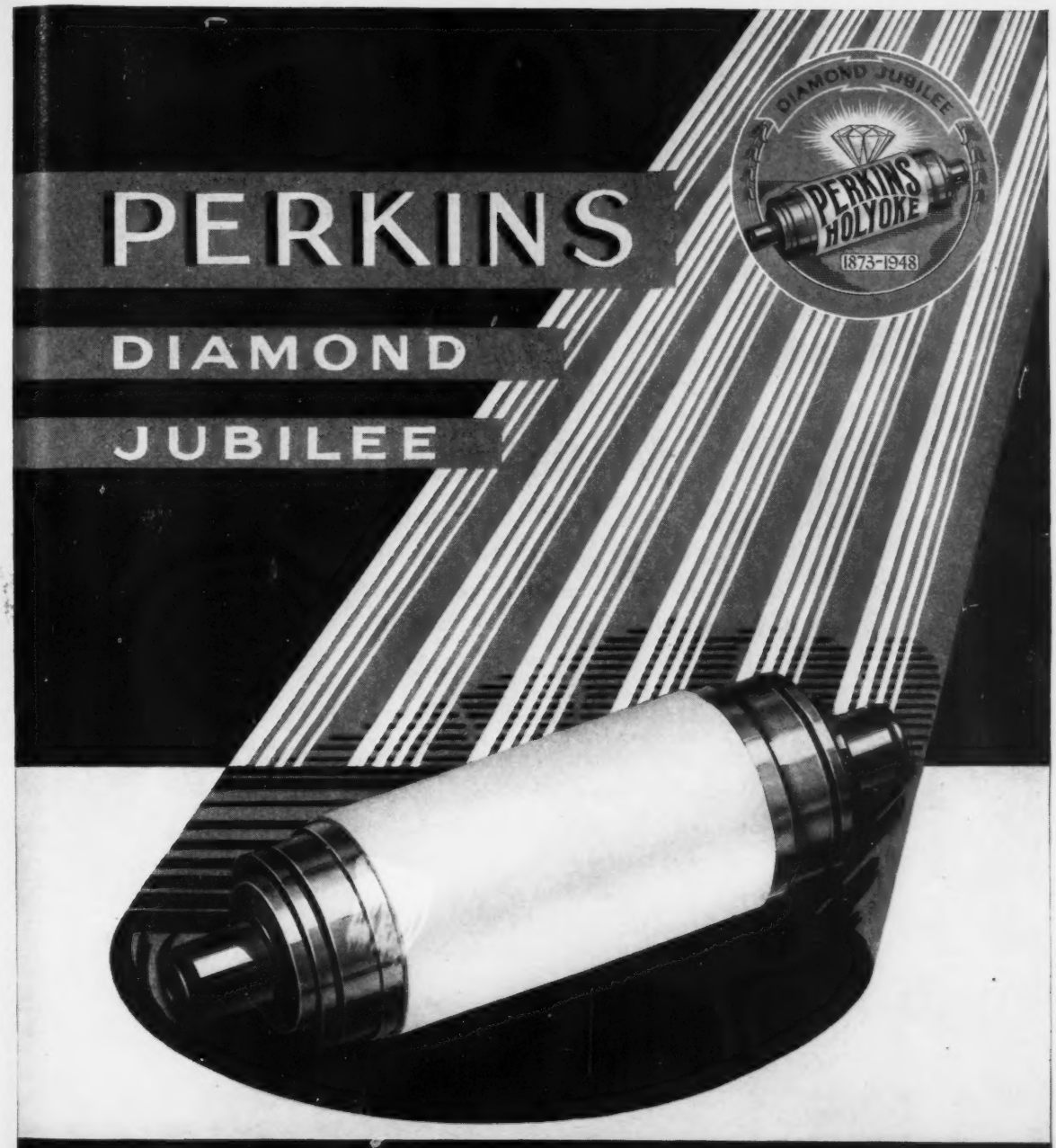
He is survived by two daughters, Mrs. Mary Ruche and Mrs. Gertrude Frohlichman, and two sons, Edward and Sol Fishman.

Nathan Myers, president and owner of the Myers Paper Co., Paducah, Ky., died in a hospital in St. Louis on December 1, following a three-month illness.

Dan M. Beckett, age 36, secretary of the Beckett Paper Co., Hamilton, Ohio, died of a heart attack on December 3.

PERKINS

DIAMOND JUBILEE



Perkins Calender Rolls are the result of the longest and broadest experience. No Calender is better than the rolls in it.

B. F. PERKINS & SON, Inc.
ENGINEERS AND MANUFACTURERS
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Forty years ago forest conservation was a new idea. Today scientific forest practice is a reality. Roy A. Ferguson PRESIDENT

ST. REGIS PAPER COMPANY

The World's Greatest Salesman

.....IS THE PRINTED PAGE

WHEN words are printed on paper—they take wing! Swiftly, economically, they fly across the land, reach the nation, deliver their idea. That printed page may be the leaf—thin and mighty—of a Bible. It may be a magazine editorial reaching millions. Or a catalog, to bring some wistful girl her dream.

ST. REGIS, with its vast facilities, its $80,000,000 invested in mills and plants and timberlands, is constantly making technical advancements for increased brightness, opacity and improved printability of its paper. This is our particular part in giving the printed page the qualities that free the message for its full import.

ST. REGIS PAPER Company

230 PARK AVENUE, NEW YORK 17, N. Y.

SECTION OF THE

TECHNICAL ASSOCIATION
OF THE PULP AND PAPER INDUSTRY

122 E. 42nd ST., NEW YORK 17, N. Y. Edited By R. G. MACDONALD, Secretary

A Study of Penetration of Starch Adhesive in a Coating Mixture into Base Paper*

By James P. Casey[1] and C. E. Libby[2]

In Two Parts—Part I

Abstract

Two subjects are discussed—first, the factors which affect the penetration of the adhesive in a coating mixture into base paper: second, the relationship between the depth of penetration of the adhesive into base paper and the properties of the final coated sheet.

The results indicate that the depth of penetration of the starch adhesive into the base paper is decreased by; increased sheet density, increased sizing, decreased sheet moisture content, and to a lesser extent by the presence of alumina in the sheet.

There appears to be a straight line relationship between the depth of penetration of the adhesive in microns and the ink receptivity of the coating. However, there is no definite relationship between the depth of penetration and the wax number of the coating since this property seems to be more affected by the strength of the base paper than by the depth of penetration of the adhesive. Increasing the depth of penetration of the adhesive tends to decrease the smoothness of the uncalendered coating.

In general, the wax number of the coating tends to increase with increased density of the base paper and decrease if either rosin or clay are added to the base paper.

The ink receptivity of the coating decreases with increased density when the base paper is unsized, but is not appreciably affected when the base paper is sized. The ink receptivity decreases as the amount of size in the sheet is increased.

The smoothness of uncalendered coatings is increased by increased beating of the stock used in making the base paper up to a certain point after which it is decreased. The smoothness is also increased by increased sizing.

Paper coating is an important part of the paper industry. It is a wide field which includes the application of many different types of coatings to the base paper. Some of these coatings include lacquers, varnishes, and waxes, as well as aqueous dispersions of colloidal materials such as starch or animal glue. In one type of coating, an aqueous mixture of a pigment and an adhesive is applied to the surface of the paper. This is the type of coating referred to in this paper. It is used primarily for the production of printing papers which are used in magazines and catalogues. This field of paper coating is one of the most rapidly growing phases of the paper industry.

The coating process consists of the application of the aqueous coating mixture to the surface of the paper, the drying of this coating, and its calendering to a smooth, even surface. The coating mixture is prepared by dispersing the pigment and adhesive in water separately and then mixing together. The pigments in common use are clay, calcium carbonate, satin white, and titanium dioxide. The two principal adhesives are starch and casein.

TABLE I.—EFFECT OF SHEET DENSITY ON PENETRATION INTO UNSIZED PAPER

Bleached Sulphate Pulp
No rosin—no alum

Beaten 0 minutes—700 freeness Coating—18% starch on clay
Beaten 30 minutes—560 freeness Sheet weight of bodystock—about 200 lb.
Beaten 120 minutes— 40 freeness Coating weight applied—about 35 lb.

Number of Coated Sheet	Type of Coating	Freeness of Stock in Base Paper, ml.	Width of Darkened Area, microns	Depth of Penetration of Starch, microns
7	clay-starch	700	132	104
8	clay-starch	560	86	58
9	clay-starch	40	47	19
10	umber-starch	700	78	
11	umber-starch	40	76	
12	umber-starch	700	78	
13	umber-starch	40	70	

Coated papers are useful because the coating provides a smooth, even, and continuous surface which makes a far better printing surface than that provided by an uncoated sheet. The pigment in the coating is primarily responsible for these desirable properties of coated paper, whereas the purpose of the adhesive is to bind

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[1] Member TAPPI; Tech. Service & Products Development Department of A. E. Staley Mfg. Co., Decatur, Ill.

[2] Member TAPPI; Professor of Pulp & Paper Manufacture, New York State College of Forestry, Syracuse, N. Y.

TABLE II.—EFFECT OF SHEET DENSITY ON PENETRATION

Coated Sheet Number	Rosin, %	Alum, %	Freeness of Stock, ml.	Amount of Penetration of Starch, microns
44	0	0	710	38
48	0	0	130	23
59	1.50	3.75	707	15
63	1.50	3.75	127	0

the pigment particles to one another and to the surface of the sheet so that the coating will not be pulled loose by the printing ink. The total strength of the bond produced is a composite effect of the strength of both the base paper and the coating layer. Some of the other important properties, in addition to the strength of the coating, are its smoothness, ink receptivity, brightness and gloss.

Aside from the conditions under which the coating is applied, the two most important factors in paper coating are the properties of the coating mixture and the properties of the paper. Some of the properties of the coating mixture which are of known importance are its solids content, its rheological properties, its "water retention," its adhesive-to-pigment ratio, and its chemical composition. Some of the important variables of the paper are its formation, finish, sizing, porosity, and color. The character of the coating mixture is of obvious importance, but the significance of the paper properties are sometimes overlooked. Some coaters have even gone so far as to regard the paper of practically no importance, inasmuch as it is covered up by the coating. Actually, the properties of the body stock have a great influence on the quality of the finished coated paper, as pointed out by Sutermeister *(1)*. Milham *(2)* believes that the base paper introduces by far the most important technical problems for the paper coater. This paper is concerned primarily with the properties of the base paper or coating rawstock and its influence on the coating process.

Importance of Penetration

In paper coating it is necessary to anchor or bind the coating to the base paper. With a porous material such as paper, this obviously implies a certain amount of penetration of the coating into the paper. It is equally obvious that penetration should not be excessive, since this would remove too much coating from the surface of the paper. According to Rowland *(3)*, there is an optimum water and adhesive transfer from coating to paper for proper leveling of the coating, for best anchorage to the base stock, and for the prevention of dusting. Dickerman *(4)* believes that the relationship between the penetrative qualities of the coating and the absorptiveness of the sheet is a highly important relationship about which little is known. Clarke, Robinson, and Harrison *(5)* state that unless the base paper has an adequate degree of resistance to water penetration, its other properties will be of little value. They also believe that the amount of pore space in the paper is a highly important property. Singleterry *(6)* believes that poorly anchored coatings are characterized by a distinct line between coating and paper, whereas strong coatings grade off into the paper for a distance of from 1 to 2 microns. According to his belief, the difference in penetration which affects the bonding strength is found in this narrow zone. In addition to its effect on the strength of the coating, penetration of the adhesive into the base paper also influences the oil or ink receptivity of the coating, since Davidson *(7)* found that the areas of the coating which took longest to dry were the least receptive to printing ink. Presumably these areas contain a higher proportion of adhesive than the surrounding coating, due to a reduced penetration of adhesive into the base paper. It is well known among practical coating men that increasing the percentage of adhesive in the coating formula will reduce the oil absorbency or ink receptivity of the coating.

TABLE III.—EFFECT OF ROSIN SIZE ON PENETRATION OF STARCH ADHESIVE

Coated Sheet Number	Rosin, %	Alum, %	Depth of Penetration of Starch, microns
85	0	0	62
87	2.00	5.00	0
87A	2.00	5.00	23

Factors Influencing Penetration

According to Bearse *(8)*, the following are the important factors which influence penetration; structure of the body stock, surface chemistry of the fibers and filler, rheological properties of the coating color, chemical nature of the coating ingredients, conditions of coating application, and conditions of drying. These factors include machine conditions and properties of the coating mixture, as well as properties of the paper. All are quite important and, in fact, are related to one another. For example, Bearse and Barclay *(9)* believe that casein-pigment coatings require less sizing in the base paper than starch coatings and that high viscosity coatings require less sizing than highly fluid coatings. As far as the properties of the paper are concerned, Frost *(10)* lists the degree of sizing and the porosity of the sheet as the two most important variables. Bearse and Barclay *(9)* also mention solid fraction and air porosity as important variables in the making of the base paper, since they influence the receptivity of the paper for the coating mixture and the strength of the final coating. Singleterry *(6)* found that increasing the rosin size in the paper reduced the amount of "keying" of the coating into the paper, but also found that better bonding was obtained on the felt side of the paper. Dickerman *(4)* reports that in machine coating, best results are obtained on unsized paper on which the absorbency is controlled by the type of furnish and fiber treatment. Very little work has been done on the effect of moisture content on the sheet, although Davidson *(7)* mentions that considerably more casein adhesive is required in a coating mixture when it is applied to a sheet containing 70% moisture compared to the amount required for paper of normal moisture content. It would appear from this that the adhesive tends to penetrate excessively when the coating mixture is applied to sheets of high moisture content.

Measurement of Penetration

Practically no work has been published on the measurement of penetration in pigment coated papers. Cobb *(11)* has given the following formula as a quantitative expression of the factors influencing penetration:

$$l = \frac{r\,\sigma\,\cos\,\Theta\,t}{2\,\mu}$$

When l = depth of liquid penetration in centimeters
r = paper pore radius in centimeters
σ = surface tension of liquid in dynes per centimeter
$\cos\,\Theta$ = cosine of angle of liquid in contact with solid
t = time of penetration in seconds
μ = coefficient of viscosity in poises.

However, this formula is useful only for water and

TABLE IV.—EFFECT OF SIZING WITH ROSIN ON PENETRATION

Coated Sheet Number	Rosin, %	Alum, %	Freeness of Stock, ml.	Amount of Penetration of Starch, microns
44	0	0	710	38
59	1.5	3.75	710	15
48	0	0	130	23
63	1.5	3.75	130	0

other simple fluids and has only a limited usefulness for a colloidal system such as a coating mixture. With colloidal systems there is another factor which is involved, and that is the electrostatic charges on the walls of the paper pores. These are important since they are capable of affecting the penetration of the clay and adhesive. According to Rowland *(3)*, if the walls of the paper pores have a negative charge, the starch adhesive and possibly some of the clay will penetrate readily into the sheet, whereas if the pores carry a positive charge, penetration wil be hindered. These effects are independent of water penetration effects and will occur in unsized papers.

The measurement of penetration is an exceedingly difficult proposition. For one thing, the coating itself is very complex and consequently may penetrate in one or more of the three following ways:

1. The coating mixture may penetrate as a whole,
2. The adhesive may penetrate preferentially into the sheet,
3. The water may penetrate faster than either the adhesive or the pigment.

The possibility of preferential penetration is great. Cobb *(12)* believes that the casein adhesive in a casein-clay coating mixture penetrates to a greater extent than the pigment, thus resulting in a separation of the adhesive and pigment. Singleterry *(6)* states that when a coating picks, the zone of failure is a micron or so away from the interface on the coating side, thereby indicating that this region is appreciably lower in adhesive content than the rest of the coating. Davidson *(7)* believes that in most coatings a large proportion of the total casein traverses the interface between the coating and the base paper although he has no data to substantiate this conclusion. He believes that preferential penetration of the adhesive takes place to a large extent on weakly sized papers. It appears likely that preferential penetration would be most pronounced with coating mixtures of low viscosity and low solids content, and this very probably explains the fact that a low solids coating mixture produces a weaker coating than a high solids coating mixture of the same per cent composition.

Statement of Problem

This problem is concerned with the factors which affect the penetration of the adhesive in a coating mixture into base paper. Since there are a large number of factors which affect the amount of this penetration, it would be impossible to study all of them. Consequently, the work was limited to a study of the properties of the base paper. In accordance with this plan, the same coating mixture and the same conditions of application were used throughout the work in order to keep these variables under control. A second phase of this problem is concerned with the effect which the depth of penetration of the adhesive into the base paper has on the properties of the final coated paper. Hence, the object of this study is twofold: first, to determine the importance of penetration in paper coating processes; and second, to study some of the properties of the base paper which affect the depth of penetration.

Only three properties of the base paper were studied, and these were selected because they were considered the most significant. These properties are porosity, sizing, and moisture content. In the various experiments which were carried out, the porosity was varied over a wide range by varying the amount of beating which the stock received. The sizing was varied through the addition of rosin from 0 to 4% on the weight of the fiber, using appropriate amounts of alum in each case. The moisture content was varied from approximately 0 to 57%. All sheets were made and coated by hand under the same conditions. A clay coating containing starch as the adhesive was used in most of the experiments.

All coatings were tested for depth of penetration by first staining with iodine and then examining under the microscope. In addition, wax pick tests and ink receptivity tests were made on most coatings and, in a few cases smoothness tests were made. An attempt was made to establish a relationship between the amount of penetration of the adhesive into the base paper and the strength, smoothness, and ink receptivity of the coating.

TABLE V.—EFFECT OF SHEET MOISTURE CONTENT ON WAX TEST AND INK RECEPTIVITY

50% Bleached Sulphate—50% Soda
Beaten 10 minutes

Coated Sheet Number	Type of Added Agent	Added Agent, %	Alum, %	Moisture in Sheet, %	Wax Number: No Pick	Wax Number: Apprec. Pick	Ink Receptivity
98	none	0	0	0.69	7.5	8.9	26.7
99	rosin	1.0	2.5	0.59	..	..	23.0
100	Mersize	1.0	2.5	0.67	7.0	7.9	25.3
101	sodium hydroxide	0.75	2.5	0.60	8.0	9.0	27.4
102	none	0	0	6.2	8.0	9.5	28.6
103	rosin	1.0	2.5	6.4	7.3	7.9	24.4
104	Mersize	1.0	2.5	6.3	7.4	8.2	24.7
105	sodium hydroxide	0.75	2.5	6.5	8.5	9.4	27.4
106	none	0	0	16.2	7.6	9.3	28.6
107	rosin	1.0	2.5	16.4	7.2	8.0	23.3
108	Mersize	1.0	2.5	17.2	6.4	7.2	23.3
109	sodium hydroxide	0.75	2.5	17.6	7.7	9.5	26.7
110	none	0	0	42.0	8.7	9.6	33.3
111	rosin	1.0	2.5	47.4	5.9	6.6	24.7
112	Mersize	1.0	2.5	36.2	6.0	6.9	23.6
113	sodium hydroxide	0.75	2.5	35.7	7.7	9.2	30.3
114	none	0	0	56.4	7.1	8.5	32.3
115	rosin	1.0	2.5	56.0	3.8	5.0	25.0
116	Mersize	1.0	2.5	57.7	4.0	5.8	25.0
117	sodium hydroxide	0.75	2.5	56.5	7.7	9.4	30.3

TABLE VI.—EFFECT OF TREATMENT OF LINER IN MULTIPLY BOARD

50% Bleached Sulphate—50% Soda

Coated Sheet Number	Treatment of Liner Stock	Wax Number: No Pick	Wax Number: Apprec. Pick	Ink Receptivity	Depth of Penetration of Starch, microns
131	No liner used	4.5	6.0	28.6	27
132	Untreated	4.9	5.8	27.7	31
133	Rosin plus alum	1.9	3.0	23.8	3
134	Starch plus alum	4.4	6.0	22.7	46
135	Clay plus alum	1.8	2.4	33.3	93

TABLE VII.—EFFECT OF PENETRATION ON WAX NUMBER

Coated Sheet Number	Depth of Penetration of Starch, microns	Wax Number, no pick
88	272	6.0
85	62	5.6
87	23	3.3

Methods of Preparation and Testing

Many of the methods of preparation and testing used in this work are not standard procedures, and hence it is worthwhile to describe them fully.

Preparation of Coating Mixtures

Coating mixtures were prepared throughout the course of the work as needed. A stock dispersion of clay and water was prepared at the start of the work, and this was used for making up all the coating mixtures. The starch solution was prepared fresh for each coating mixture.

The clay dispersion was made by dispersing 5000

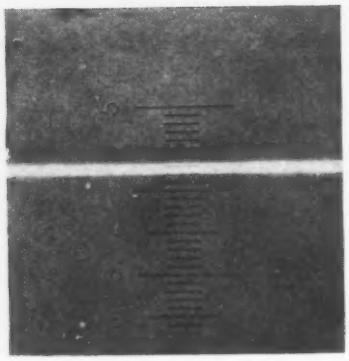


FIG. 1

grams of a medium grade coating clay, 15 grams of sodium hexametaphosphate (Calgon), and 15 grams of sodium pentachlorophenate, and 500 grams of water in a Waring blender for 7 minutes. The dispersion was then screened through a 100-mesh screen and stored in a large container. It contained 69.97 grams of solids per 100 milliliters or, in other words, 49.6% solid matter.

The starch solution was prepared at various intervals by cooking 50 grams of an oxidized starch and 175 grams of water for 15 minutes at 95° C. The starch was a highly oxidized corn starch made by the treatment of native starch with sodium hypochlorite under alkaline conditions. It is widely used commercially in paper coating. After cooling the starch solution to 50° C. and correcting for the water which was evaporated during the cooking, the starch solution was added to the clay and the two stirred for 15 minutes by means of a motor driven stirrer. In making a batch, 404 grams of clay dispersion and 135 grams of starch solution were used. This gave 18% commercial starch, based on the weight of oven-dry clay. This formula represents a typical coating mixture.

In a few cases, casein and polyvinyl alcohol were used as the adhesive. The casein was prepared by using 8 parts of sodium carbonate and 8 parts of borax per 100 parts of casein by weight, together with enough water to make a total of 510 parts of water per 100 parts of casein. The dispersion was heated to 60° C. The polyvinyl alcohol was prepared by mixing with water in the ratio of 13.65 parts of water per part of alcohol and heating to 85° C. In both cases, the adhesive was mixed with the clay in the same manner as used with starch, with the exception that a lower percentage of adhesive was used.

The only viscosity reading obtained on the coating mixture was made with an orifice type glass viscosimeter which had a water time of 5.2 seconds.

Preparation of Handsheets

All coating was done on handsheets which were prepared in the laboratory, using the British sheet machine. The TAPPI standard procedure (T205m-45) for making handsheets was followed with a few exceptions. In most cases, sheets of high basis weight were prepared in order to facilitate the taking of photographs. Several runs were made on sheets of about 40 pounds weight (25 × 38 — 500), and others on sheets in the neighborhood of either 85 pounds or 190 pounds.

All sheets were air-dried before coating, with the exception of those which were coated in a wet condition. The latter were pressed as usual and then given a special conditioning in dessicators which were maintained at different humidities in order to bring the sheet to the desired moisture content. This procedure will be described later.

The fibrous furnish used in making the handsheets was either 100% bleached sulphate or a 50-50 mixture of bleached sulphate and bleached soda pulp. In order to make sheets, samples of the beaten stock were removed and diluted. When the pulp was sized or treated in any way, the material was added to the stock in this diluted form and mixed for 15 minutes by means of a motor driven stirrer. If two materials were added (such as rosin and alum), the stock suspension was stirred for 15 minutes between each addition. In the preparation of sized papers, commercial size was used. This contained 3.78 grams of solids per 100 milliliters of solution. The alum used was a commercial alum which had been dissolved to produce a 10% solution. In one series of experiments, a special sizing agent sold under the trade name of Mersize was used. This was diluted to a 1% solution of dry solids.

Preparation of Coated Samples

All samples were coated, using the wire-wrapped coating rods which are sold by the R. D. Specialties Company of Rochester, New York. These rods come in a large number of sizes which permit the application of coatings of any desired weight. In most cases, rod No. 32 was used, but rods of different sizes were used in a few experiments. The weight of coating applied varied from 18 pounds to about 35 pounds (25 × 38 — 500) per side, depending upon the coating rod used. The weight of coating which is present on a coated sheet affects the properties of the sheet. In general, both the ink receptivity and the wax test tend to decrease with increasing weight of applied coating *(13)*,

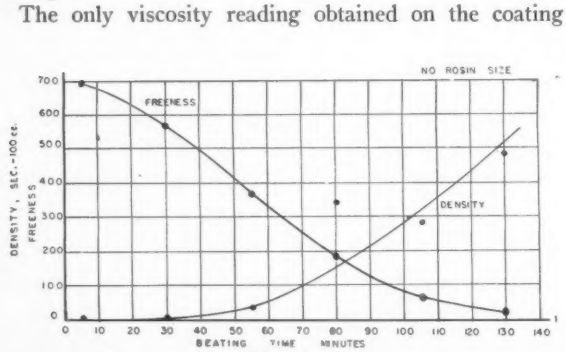


FIG. 2
Relationship Between Freeness of Stock and Gurley Density of Handsheets

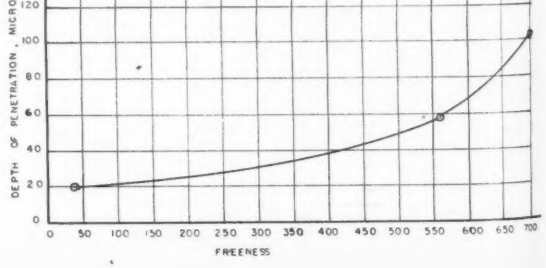
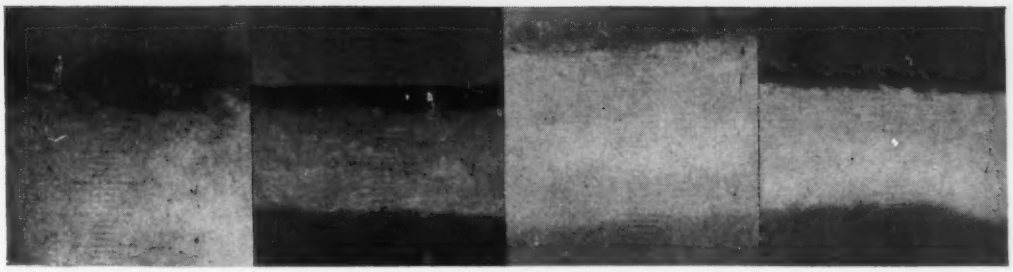


FIG. 3
Effect of Density of Base Paper on Penetration of Starch Adhesive



Sheet No. 7 Sheet No. 9 Sheet No. 10 Sheet No. 11

FIG. 4

although the results are somewhat variable depending on the type of paper and coating mixture.

In applying the coating the rod was placed upon the surface of the sheet close to one end. The coating mixture was poured in a line ahead of the rod and then the rod drawn with a steady motion and light pressure across the surface of the sheet. Finally, the coating was allowed to air dry. Usually the coating was applied to the smooth side of the sheet, or in other words, the side of the sheet which had been dried in contact with the polished metal drying plate. However, in the case of those sheets which were coated in a wet condition, the coating was applied to the rough side of the sheet. At least four coated sheets were made for each experiment.

Measurement of Penetration

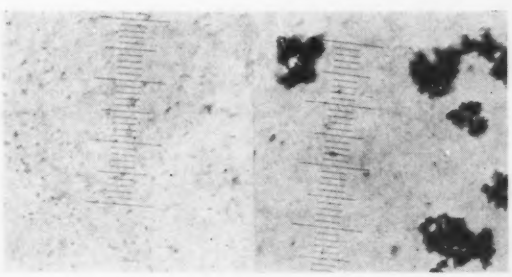
The amount of penetration was measured on sheets coated with a starch-clay coating mixture by staining a cross-section of the coated sheet with iodine and measuring the depth of the blue colored layer under the microscope at a magnification of 80 times. In preparing the sample, one edge of the sheet was trimmed with a sharp razor blade to expose a cross-section of the coated paper. The trimming was done with the coated side of the sheet in contact with a smooth blotter in order to prevent disruption of the coating. The sheet was cut from the uncoated side to the coated side in order to prevent any of the coating from being carried into the sheet. Next, a long strip of the same sheet was cut and placed in a special clamp with the exposed edge at the top. This edge was then stained with iodine solution using a cotton swab. This was pressed against the edge of the paper and held there for a few seconds without moving. The width of the blue colored layer included both the thickness of the coating and the depth of penetration of the starch into the base paper. In order to correct for the thickness of the coating, several coatings were made on plate glass and their thickness determined. The thickness of this coating was then subtracted from all readings to give the actual penetration of starch into the base paper. It is possible that the thickness of the coating on plate glass was not the same as that obtained on paper. However, the thickness of the coating on the two materials was probably of the same magnitude as evidenced by the fact that the coatings applied to those sheets of high density and high rosin size content were about the same thickness as those on plate glass. In cases where the base stock was sized with rosin, a small amount of wetting agent (Aerosol OT) was added to the iodine stain. This not only insured contact between the starch and iodine throughout the sheet, but also caused the sized sheets to swell as much as the unsized sheets. Nearly all sheets were photographed in the wet state due to the presence of the iodine solution.

In nearly all cases, photographs were taken to the cross-sections of the coated sheet, and a few of these are included in this paper. In these photographs the area containing starch is dark colored whereas the rest of the sheet is white. The penetration has been reported as the depth of penetration of starch beyond the coating layer. As mentioned above, this figure was obtained by taking the width of the total darkened area and subtracting the thickness of the coating obtained on plate glass. The value for penetration which is reported was taken as the average of several readings from two coated sheets. The photograph was taken at a spot on the sheet where the depth of penetration was about average, but it does not always agree exactly with the reported result.

A scale on the eyepiece was superimposed on all photographs in order to permit actual measurement of the depth of penetration. One small division on this scale is equal to 15.6 microns. Since one-half division is about as close as the penetration can be estimated at this magnification, it is possible to estimate the depth of penetration within the limits of 7 to 8 microns. It is quite possible that differences in penetration of the order of 1 to 2 microns may be significant in coating, but it was impossible to measure penetration this accurately with the techniques used. Any statements regarding penetration made in this paper are based upon these limitations.

The photograph in Fig. 1 was taken after coating a piece of plate glass with the regular starch-clay mixture using the No. 32 rod. The white area, which is the dried coating, is 24 microns in width, and hence this figure was subtracted from all readings to obtain the actual penetration of the starch into the base paper. A few coatings were made with rod No. 46, in which case a value of 28 microns was subtracted.

In a few experiments sheets were coated with starch and umber instead of the usual starch and clay mix-



Clay Umber

FIG. 5

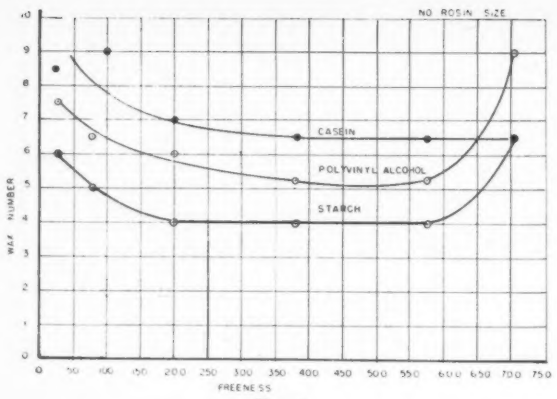


FIG. 6
Effect of Sheet Density on Wax Number of Coating

ture. The object of using umber as the pigment was to permit the taking of photographs which would show how far the pigment had penetrated into the base paper. Since umber is dark brown in color, it shows up readily without staining. Thus, it was possible, by using more than one sample, to measure the depth of penetration of the umber in one case and the depth of penetration of the starch in the other. By combining the two results, it was possible to obtain an indication of the relative penetration of the pigment and the adhesives. However, unless otherwise noted, the penetration referred to in this paper is the depth of penetration of the starch adhesive into the base paper.

Testing of Coated Samples

The coated sheets were tested for the strength of the coating by means of the Dennison wax pick test according to the TAPPI standard procedure (T459m-45). This test uses a series of waxes of graded strength in which the higher wax number denotes a coating of greater strength. Usually the wax which showed no pick was recorded, although in a few cases the wax which showed an appreciable pick (i. e., about one-third the area) was also given. There are two distinct types of pick. The first of these is known as a coating pick and is characterized by the coating being lifted from the paper without disturbing the fibers in the base paper. The second is known as a bodystock pick, since it results in a splitting or lifting in fibers from the base paper. Most of the picks obtained in this work were bodystock picks.

The ink receptivity test was made by applying a thin layer (about ⅛ inch thick) of K and N standard testing ink to the coating. After standing for exactly 4 minutes, the ink was scraped off with a spatula and the spot rubbed dry with a clean piece of cheesecloth. Next, the inked sheets were allowed to air dry for 30 minutes and then tested on a photometer. The ink receptivity of the coating was indicated by the depth of color of the inked area corresponding to the amount of ink absorbed by the coating. Both the Photovolt brightness tester, which is manufactured by the Photovolt Corporation, New York City, and the Bausch and Lomb opacimeter, which is manufactured by the Bausch and Lomb Optical Company of Rochester, New York, were used. Neither one gave results which correlated exactly with a visual rating of the samples, but the Bausch and Lomb opacimeter was the better of the two. In making tests with this opacimeter, the instrument was first standardized at 0 with the black body and 100 with the white body. Readings were then taken on the inked area, first with the sheet backed with the white body and then backed with the black body. Since the sheets were nearly opaque, there was very little difference between the two readings. The ink receptivity value was obtained by dividing the reading when backed by the black body into 100. This test is suitable only for approximate comparisons, as pointed out by Landes *(13)*, but it is useful and convenient for that purpose.

Smoothness tests were made using the Gurley instrument, manufactured by W. and L. E. Gurley, Troy, New York, with a modified technique. The method used was to cut two small pieces from the same sample of coated paper and place them in contact with the coated sides together. A hole was punched between both samples and they were then placed in the instrument sandwiched between two rubber diaphragms, the top diaphragm having a hole punched in it. After putting pressure equivalent to the lever arm only on the assembly, the time was taken for 100 cc. of air to pass between the two contiguous coated surfaces. This was taken as an indication of the smoothness of the coatings.

Experimental Part (Part I)

The following are the experiments which were carried out in the study of penetration. The experiments in Part I were designed to study the factors which affect penetration of the starch adhesive of the coating mixture into the base paper. It has been found convenient to give each experiment a number and for the same reason, each coated sheet prepared in the various experiments has also been given a number.

Relationship Between Freeness and Density

A considerable part of the work in this paper is concerned with the effect of porosity of the base paper on the penetration of the starch adhesive into the base

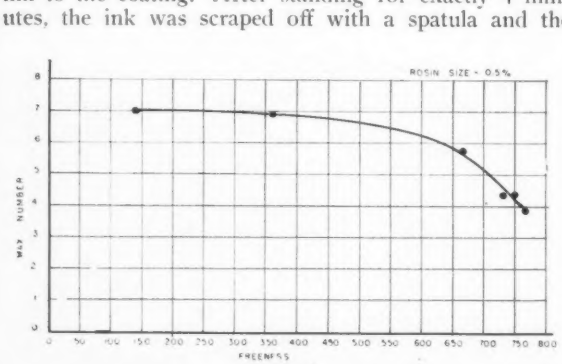


FIG. 7
Effect of Sheet Density on Wax Number

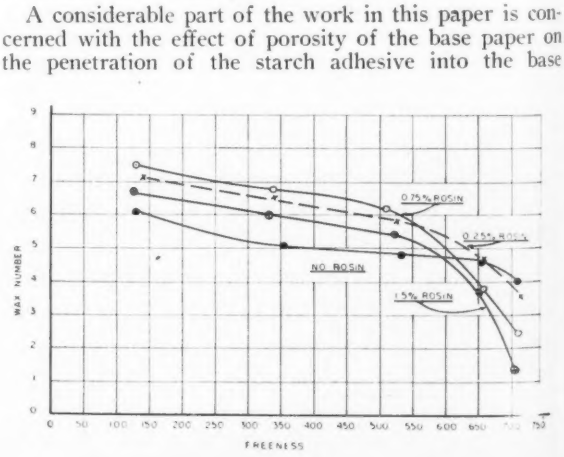


FIG. 8
Effect of Sheet Density on Wax Number

paper. In all cases the porosity was varied by beating the stock to different degrees of freeness. In describing the results, the term density has been used in place of porosity, and for this purpose density has been considered as the opposite of porosity. Actually, no attempt was made to measure the true density or weight per unit of volume of the base paper. Since no density values were obtained, the freeness of the base stock was used as an indication of the density of the paper. This seems valid in view of the well-known relationship between freeness of the stock and density of the paper when other conditions under which the paper is made are kept constant. Hence, in all the following experiments on the effect of density, the results of the wax test and ink receptivity test on the coated sheets have been plotted against the freeness of the stock used in making the base paper. In order to show the relationship which exists between the freeness value and the sheet density, Experiment No. 1 was carried out. The results of this work are reported in Fig. 2.

The freeness was determined by means of the Canadian Standard freeness tester, using a 0.3% consistency at 20° C. and the results recorded in milliliters. The density was measured by means of the Gurley densometer, which is manufactured by W. and L. E. Gurley of Troy, New York, and the results reported as number of seconds for 100 cc. of air to pass through the sheet. The higher the reading, the greater the density (the lower the porosity) of the sheet. The limits within which the density was varied were 1 to 485 seconds. These cover a much wider range than usually employed in making base paper for coating, since three different commercial coating rawstocks had densities of 26, 28, and 46 seconds.

Effect of Density of Base Paper on Penetration in Unsized Paper

Experiment No. 2 was designed to show the effect of density as measured by the freeness of the stock on the penetration of the starch adhesive into the base paper. Handsheets of relatively high basis weight were prepared from stock at three different freeness values, using no rosin or alum. The sheets were then coated with either a starch-clay or a starch-umber coating mixture. The results are shown in tabulated form in Table I and in curve form in Fig. 3, where the depth of penetration of starch into the base paper has been plotted against the freeness of stock used in making the paper. A few photographs are shown in Fig. 4. These results show that the amount of penetration of the starch decreased as the density of the sheet due to beating was increased, having decreased from 104 to 19 microns. On the other hand, the penetration of the umber was not appreciably affected by the density of the sheet, as shown in Table I and photographs of sheets Nos. 10 and 11.

In general, the above results indicate that the starch penetrates to a greater extent than the pigment. However, the same effect may not be obtained with clay, since it may have a different particle size or other different properties than umber. The photographs of umber and clay suspensions shown in Fig. 5 would indicate that the particle size of the two pigments are quite different. However, these photographs were taken in water suspension and it is possible that a different situation exists in the coating mixture. The umber dispersion has the appearance of a flocculated pigment, and it is possible that the presence of the starch adhesive in the coating mixture may reduce the particle size through deflocculation.

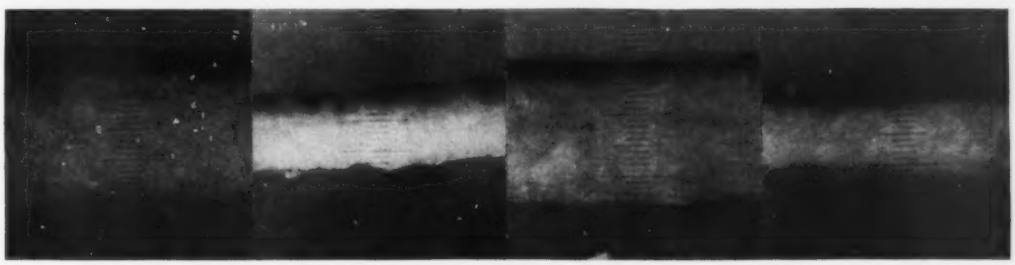
Effect of Density on Wax Test Using Unsized Papers

Experiment No. 3 shows the effect of sheet density as indicated by the freeness value on the wax pick test. No rosin or alum was used, and the sheets were made in medium weight—i.e. about 40 pounds (25 × 38—500). No penetration studies were made, but the results of the wax test which were obtained on the coatings are plotted against the freeness of the stock used in making the base paper. Some of the data are plotted in Fig. 6. The percentage of adhesive based on the weight of the clay differed, being 6% for the polyvinyl alcohol, 15% for casein, and 19.5% for the starch. The wax number which was plotted in Fig. 6 was the one which showed no pick.

In general, these values indicate a high wax pick test at low freeness values and at very high freeness values. The shape of the curve indicates that over part of the range there is a tendency for the wax pick test to increase as the density of the sheet is increased. However, for the most part the wax test was relatively constant between 250 to 500 freeness, corresponding roughly to a Gurley density of 100 to 10 seconds, which pretty well covers the commercial range. There was a tendency for the wax number of the starch and polyvinyl coatings to show a sharp increase on sheets of very low density. It is theorized that this is partly caused by the manner in which the coating penetrates into the bodystock. It is theoretically possible for the coating to penetrate as a whole, i.e., clay and binder, into a highly porous sheet, whereas with a less porous sheet, the pigment may tend to remain on the surface and only the adhesive penetrate into the paper. This theory is supported by the fact that a bodystock pick is obtained on the porous sheet and a coating pick on the dense sheet.

The difference in the behavior of casein on one hand and polyvinyl alcohol and starch on the other may be

* Measured by floating a sample of unsized paper on some of the coating mixture and taking the time for penetration of liquid through the paper.



Sheet No. 44 Sheet No. 48 Sheet No. 59 Sheet No. 63

FIG. 9

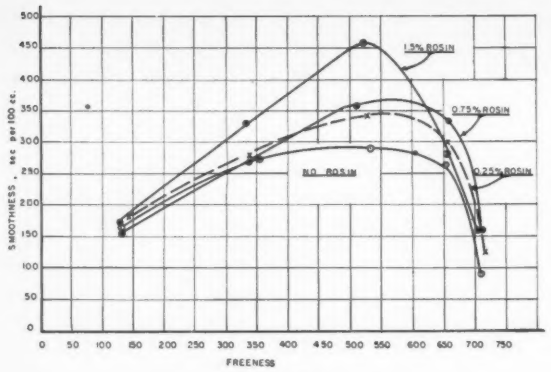


FIG. 10
Effect of Sheet Density on Smoothness

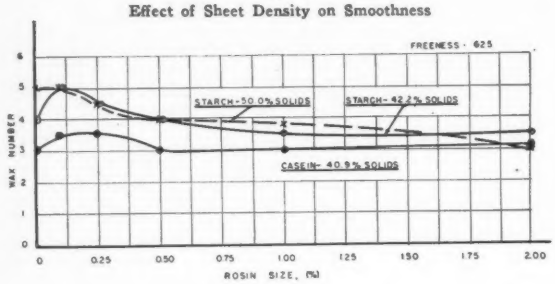


FIG. 11
Effect of Rosin Size on Wax Number

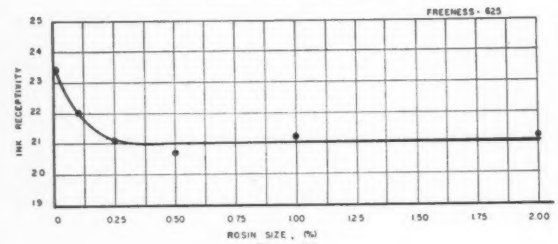


FIG. 12
Effect of Rosin Size on Ink Receptivity

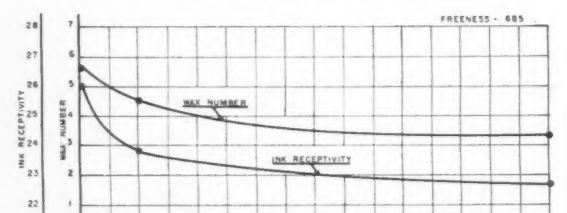


FIG. 13
Effect of Rosin Size on Wax Number and Ink Receptivity

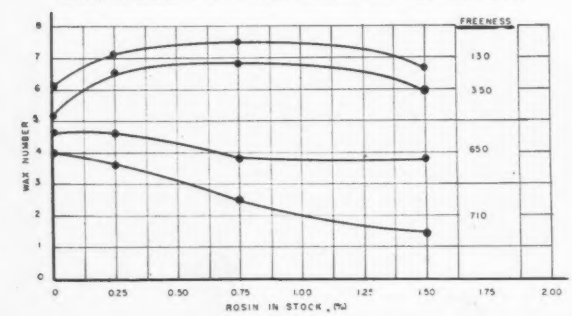


FIG. 14
Effect of Rosin Size on Wax Number

caused by the difference in the water retention of the coatings. The casein coating had a higher water retention (16.7 sec.) than either the polyvinyl alcohol (7.3 sec.) or the starch (13.7 sec).* It might be surmised that because of its high water retention, the casein coating has less tendency to penetrate into porous sheets, although there is no evidence to support this conclusion

Effect of Density on Wax Test, Ink Receptivity, and Penetration, Using Sized Papers

Experiment No. 4 was carried out to determine the effect of density on sheets of constant sizing. In this case, 0.5% rosin and 1.25% alum were used, and heavy sheets (about 85 pounds) were made, using stock which ranged in freeness from 765 to 140ml. The coating weight was about 25 pounds. The sheets were examined under the microscope, and it was found that there was no significant difference in the depth of penetration on the high density and low density sheets. Apparently the presence of 0.5% rosin in the sheet was sufficient to offset any effect which would be expected due to differences in the densities of the sheets.

The ink receptivity values which were obtained in this experiment were obviously not true values since they did not agree well with a visual rating on the sheets. Since there was no appreciable difference in the color of the inked sheets according to the rating by eye, it was concluded that there was no noticeable effect in the ink receptivity.

The wax number was appreciably increased as the density was increased, although it remained reasonably constant from a freeness value of 140 to about 500 ml., as shown in Fig. 7. The shape of the curve in Fig. 7 differs from that in Fig. 6 because of the presence of 0.5% rosin in the base paper which apparently influences the wax number in the range of low sheet density.

Experiment No. 5 was carried out to show the effects of sheet density on the wax pick, ink receptivity, and amount of penetration, using sheets of different degrees of sizing. In this case, the base stock was 85 pounds and the coating weight was about 25 pounds. The results are plotted in Fig. 8. As far as the wax pick test is concerned, these results showed the same general effect as experiment No. 4 in that the wax test tended to increase as the density of the sheet was increased. One very interesting effect was that the decrease in wax test which occurred in the sheets of low density was greatest in the sheets of high rosin content. This could be caused by differences in the penetration although it might be a general weakening of the sheet brought about by the rosin. The ink receptivity was not greatly affected by changes in density although there was a tendency for a slight decrease as the density of the sheet was increased in the case of those sheets containing no rosin size.

The effect of sheet density on penetration in sheets containing two different percentages of rosin is shown in Table II as part of the data which is obtained in experiment No. 5. Photographs of these sheets are shown in Fig. 9. These results show that increasing the density decreased the amount of penetration slightly, which is at variance with the conclusion from experiment No. 4.

(To be concluded in December 23 issue)

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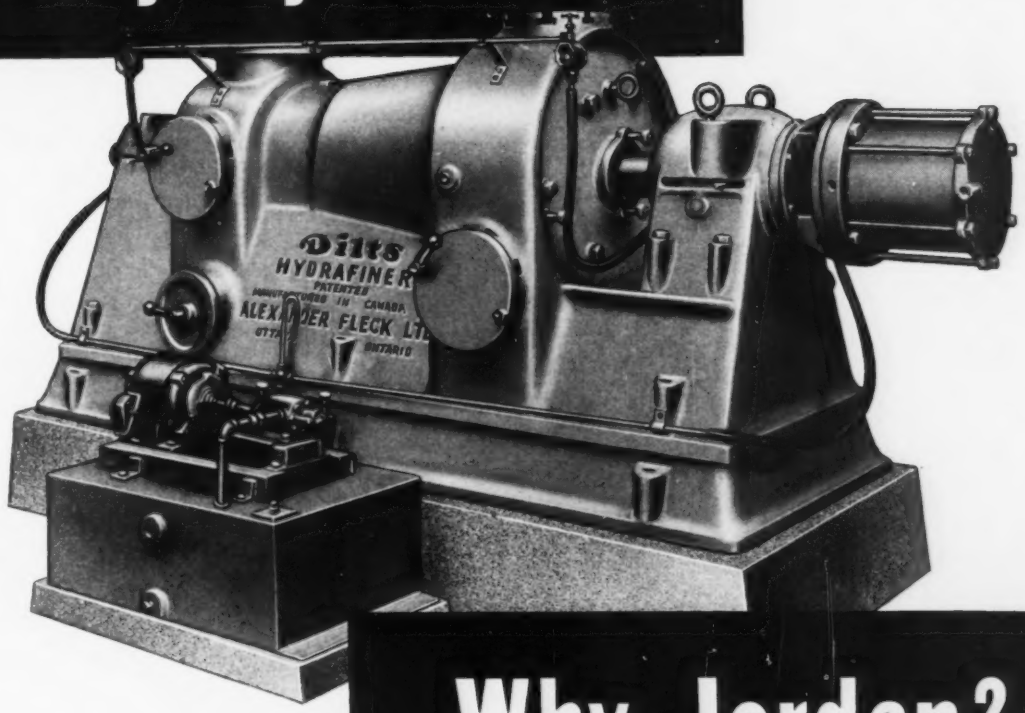

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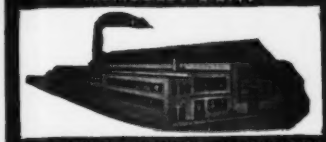

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1—American Blower #700
1—American Blower #750
3—Buffalo Forge Co. #24 Cast Iron Blowers

CALENDER ROLLS

6—116" face x 9½" diameter.
4—104" face x 9¼" diameter.
3—104" face x 12½" diameter
32 Rolls—various sizes.

CALENDER STACKS

1—104" face 5 roll stack, with drive.
1—76" face 7 roll with drive.
1—76" face 3 roll with drive.
1—112" face 7 roll.

CONVEYOR

1—18½ ft long x 30" wide—with motor.

COUCH ROLLS—BRASS

1—104" face x 18" dia.
1—118" face x 18" dia.
1—150" face x 16" dia.
1—92" face x 19½" diameter.
2—94" face x 21¾" diameter.

COUCH ROLLS—RUBBER

1—110" face x 20" dia.—New
1—139" face x 19" dia.
1—141" face x 21" dia.

CYLINDER MOLDS

4—IMPCO 40" diameter x 84" face
2—36" diameter x 136" face Cylinder molds with vats, couches—ball bearing.
2—74" face x 36" diameter.
1—134" face x 36" diameter, with stainless steel shafts.
1—78" face x 36" diameter.

CYLINDERS AND VATS

2—136" face x 36" dia.—with vats, couch, complete.

DRIVE

1—6C. Reeves Drive.

DRYERS

4—74" face x 28" diameter with gears.
5—143" face x 48" diameter.
2—141" face x 48" diameter Creping Dryers —ball bearing.
4—124" face x 48" diameter.
6—30" face x 38" diameter.
1—72" face x 48" diameter—with gear.
1—64" face x 36" diameter.
15—78" face x 36" diameter, complete with 2 deck frames, gears, bearings and steam joints. Drives, line shaft and felt rolls are available.
1—78" face x 18" diameter with gears and bearings.
2—46" face x 24" diameter—chromium plated.
1—120" face x 16" diameter—Baby Dryer.

EMBOSSER

1—Waldron 40"—ball bearing—complete.

EXTRACTOR ROLLS

1—Downingtown—84" face x 17" diameter.

FLAT SCREENS

3—10 plate Sandy Hill.
1—Sandy Hill 8 plate—with scraper.
1—New Sandy Hill 12 plate, with scrapers and V-belt drive.
1—Montague 6 plate—ball bearing.

FOURDRINIER SECTIONS

1—P & J 158" x 80 ft. ball bearing. Complete from inlet to 22" diameter suction couch. Brass and Rubber covered table rolls. 6 Brass Suction Boxes operated at 1000' per minute.
1—M & W 82" x 49' complete with 3 suction boxes, shake, 3 section presses and size press.

HAMMERMILLS

1—American Hammermill—37" anti friction bearing equipped.

HEAD BOXES

1—118" Bronze Lead Lined. Geoit

INLETS

1—Voith inlet for 151" wire with 28" slice. Complete, including drive.

JORDANS

1—Jones Standard—ball bearing direct connected to 150 h.p. G.E. 440 volt motor.
1—#3 Miami, for motor drive.
1—Jones Standard for V-Belt Drive.
1—Jones Majestic, roller bearing—stainless steel filling—for motor drive.
4—Jones Majestics with base and couplings—bronze filled, 2 sets of new bronze fillings.
2—#3 Appleton with base and coupling—bronze filled.
1—Dillon Horne #2—direct connected 75 h.p. Stainless steel ¼" filling.
1—#4 Smith & Winchester—Ball bearing.

LABORATORY EQUIPMENT

1—12" 6 roll calender stack with Westinghouse 7½ h.p. motor.
1—New E. D. Jones 17# iron tub beaters, stainless steel fillings.

MOTORS

1—Fairbanks Morse — 30 h.p. — 485 r.p.m. — 220/440/360.
1—Reliance 25 h.p. ball bearing, 550 v., 3 phase, 60 cycle—1750 r.p.m.
1—Electric Machinery Company Synchronous—2800 h.p., 2200 v., 3 phase, 60 cycle, 225 r.p.m. with complete starting equipment.
1—Reliance 25 h. p., ball bearing, 440 v., 3 phase, 60 cyc., 1750 r.p.m.
1—General Electric 150 h.p.—440 v.—3 phase—60 cycle—600 r.p.m.

PRESS ROLLS

1—110" face x 15" diameter—rubber.
1—101" face x 16½" diameter—rubber.
1—123½" face x 17½" diameter—rubber.
1—112" face x 15" diameter—rubber.
1—127" face x 17½" diameter—brass.
1—117" face x 24" dia.—Brass.
1—84" face x 20" dia.—Rubber.
1—176" face x 22" dia.—Rubber.
2—110" face x 21" dia.—Rubber.
1—147" face x 11¾" dia.—Rubber.
1—74" face x 18" diameter—Rubber.
1—109" face x 17" diameter—Rubber.
1—136" face x 22" diameter—Brass.
1—102" face x 16" diameter—Rubber.
1—119" face x 17" diameter—Brass.
1—76" face x 10" diameter—Brass.
1—53" face x 14" diameter—Brass.
1—53" face x 12" diameter—Iron.
1—55" face x 10" diameter—Iron.
1—74" face x 16" diameter—Iron.
1—73" face x 14" diameter—Iron.
1—102" face x 18" diameter—Brass.

PULP EQUIPMENT

1—Jigger—1 deck—vibrating screen.
1—Mitts & Merrill #17 Pulpwood chipper
1—5' Carthage Disc Barker
1—88" Carthage Ball Bearing Chipper—4 knife
2—New Stedman Disintegrators—50".

PULPERS

1—Bird Pulper
1—#2 Lamnsye Pulpers

PUMPS

1—Worthington Monoblock—250 g.p.m.—130' head—direct connected to 15 h.p.—3500 r.p.m.—220/440 volts, totally enclosed, ball bearing motor.
1—Ingersoll Rand—50 g.p.m.—210' head—direct connected 7½ h.p.—220-440 volt—3 phase—60 cycle totally enclosed motor.
1—New Warren—all bronze, 30 g.p.m.—60' head—connected to 1½ h.p.—440 volt motor.
2—Ingersoll Rand 150 g.p.m.—75' head—connected to 5 h.p. motor—220/440 volt motor.
1—Worthington—2000 g.p.m.—250' head.
1—Worthington 3 x 4—300 g.p.m. 75' head—1750 r.p.m. Ball bearing for motor drive.
1—Trench Marine ball bearing. 500 g.p.m.—400' head.

PUMPS—OPEN IMPELLER

1—Morris open impeller—9" suction—5" discharge —belt driven.
1—Morris Vertical Open Impeller 6 x 6—300 g.p.m. 5 percent stock—50' head—connected to G.E. 15 h. p. 220-440 volt 3 phase—60 cycle—1165 r.p.m.
5—New Gouids—ball bearing—6" suction—4" discharge—700 g.p.m.—60' head. Requires 20 h.p. at 1750 r.p.m.
5—New Gouids—ball bearing—8" suction—6" discharge—1500 g.p.m.—45' head. Requires 25 h.p. at 1150 r.p.m.
2—New Gouids—ball bearing—6" suction x 4" discharge—600g.p.m.—50' head. Requires 15 h.p. at 1750 r.p.m.
3—New Gouids—ball bearing—8" suction—6" discharge—1200 g.p.m.—60' head. Requires 20 h.p. at 1150 r.p.m.
3—New Gouids—ball bearing—8" suction—6" discharge—1000 g.p.m. 40' head. Requires 20 h.p. at 1150 r.p.m.

REELS

2—Beloit 110" two bowl Reel.
1—Pusey & Jones 76"—2 bowl reel.
1—M & W 76" 2 bowl reel.

ROTARY KNIFE CUTTERS

3—Sprout Waldron Cutters Type F-11. 30" knives—used 30 days.

ROLLS

75—Steel—160" face x 9" diameter.
200 Assorted felt carrying.
50—Brass Chromium Plated. Ball Bearing. 60" Base x 12" Diameter
42—Steel 101" face x 7" diameter.
11—Brass 126" face x 11" diameter.
1—Brass 140" face x 12" diameter.
1—Brass 130" face x 12" diameter.
1—Brass 129" face x 13" diameter—ball bearings.

ROTARY SCREENS

1—Leithwaik Rotary Screens.
2—Jones Lalthwaik—cylinder 84" face x 28" diameter.
9—2A Bird—Copper Vats.
1—#3A Bird Rotary—copper vats—with motors —used less than 1 year.

SCREW PRESSES

2—Valley Voith Screw Presses Size 2A, with new spare sets of plates.

SHEETERS

1—Hamblet 130" heavy duty—with 12 roll back stand and layboy.
2—Hamblet 51" Single Knife with 6 roll back stands and motors.
1—Hamblet 81" Single Knife with 6 roll back stand and motor.
1—Hamblet 100" duplex wth 4 pile Erie Layboy.

SHREDDERS

3—Sprout Waldron Cutters — type F-11 — 30" knives. Used 30 days.

SLITTERS AND WINDERS

1—40" Kidder Slitter and Rewinder.
2—Pusey & Jones 160" high speed slitters and rewinders.
1—Cameron 56"—Model 6.
1—Cameron 32" type 8 Model 5A with friction tension.
1—76" 2 shaft Manning Winder.
1—76" 2 drum winder.
1—Cameron 60"—Model 16.

STUFF PUMPS

1—Beloit 10 x 20 triplex—with motors and chain drives.
1—Shartle 7 x 16 Triplex.

SUCTION COUCH ROLLS

1—Millspaugh 22" diameter x 138¾" suction face
1—Bevis 131⅞" drilled face x 26" diameter.

SUPER CALENDERS

1—9 roll 120" face.
1—9 roll 52" face.
3—7 roll 62" face.
1—7 roll 65" face.
1—7 roll 58" face.

TRIMMERS

1—58" Undercut Trimmer.
1—42" Oswego
1—Seybold 64" with motors.

VACUUM PUMPS

2—H-6 Nash—used 6 months, with motor.
1— 4 Nash Hytor.
2—Nash—#2H.
1—Nash L2.

WASHERS

1—IMCO Vacuum High Tensity Washer—8' diameter cylinder mold—Used 1 month.

AMERICA'S LARGEST BUYERS OF PAPER MAKING MACHINERY

FOR SALE

BEATERS
1—Iron tub 84x84 Shartle breaker
1—Dilts high speed with roll 56x48

CUTTERS
1—130" Horne duplex with duplex layboy
1—100" Hamblet duplex with duplex layboy
1— 94" Clark single with layboy
1— 84" Clark single with layboy
1— 70" Clark
2— 48" Hamblet

DRYERS
1—12 ft. x 186" Yankee
1—12 ft. x 130" Yankee
2— 8 ft. x 174" Yankee
5— 5 ft. x 174"
4—48 118"
2—48 x 106"
1—48 x 80"
16—36 x 65"

FOURDRINIER PARTS
1—Wire 50' x 110" anti friction with 18" suction couch and three sets presses, rolls 20 x 108".
1—180" Fourdrinier Part with 30" suction couch, 20" diameter breast roll, 8" diameter table rolls.

JORDANS
1—No. 2 Appleton, anti friction, with 150 HP motor
1—No. 5 Miami, anti friction
1—No. 2 Dillon
3—Noble & Wood Peny

MOULDS
1—36 x 125"
1—60 x 84"
1—48 x 84"
1—36 x 84"

PAPER MACHINE
1—108" trim combination machine
1—94" trim facial tissue and M G machine with 8" dia. Beloit dryer
1—84" Fourdrinier paper machine

PUMPS
2—12 x 12 Gould triplex
1—10 x 20 Shartle duplex
1— 7 x 10 Gould triplex

SCREENS
2—No. 3 Bird
Flat screens, 3 to 16 plate
Leith Walk and Moore & White rotary

SLITTERS
1—234" Rice Barton
1—150" Moore & White four drum
1—150" Warren two drum
1—130" and one 120" Pusey & Jones two drum
1—112" Kidder
1— 62" Langston
1— 56" Cameron
1— 52" 44 W Cameron

SUCTION ROLLS
1—30 x 180" Couch
1—22 x 180" Press
1—25 x 166" Couch
1—18 x 146" Couch
1—18 x 92" Couch

ELECTRIC TRUCKS
1—Baker electric truck, model D T O
1—Walker electric highway truck, 4000 lb. Capacity, Model 42 with generator
1—Automatic tractor and piler

FRANK H. DAVIS CO. 175 Richdale Ave., Cambridge, Mass. TF

FOR SALE

1—96" Cameron slitter and rewinder—type 18—100" drums—new machine (never used)—including type "C" constant web tension mill roll unit—rewind capacity 72" diameter.

J. J. ROSS COMPANY
250 Frelinghuysen Avenue,
Newark 5, N. J.
Bigelow 3-3720

D-2

POWER REAM CUTTERS

New 44" National Automatic Clamp Power Cutters, with A.C. motors — carried in stock, ready immediate shipment.

Also specializing in the New 36" National Hydraulic. Send for full details on this new smooth-running machine.

THOMAS W. HALL COMPANY, INC.
Stamford, Conn.
(N. Y. Sales Office: 120 West 42nd St.)

Also rebuilt Sheeters, Slitters, and Rewinders.

TUBE & CORE MACHINERY FOR SALE BARGAINS

1—Langston Single Belt Spiral Paper Tube Winder & Cut-Off saw, one glue pot, suitable for toilet cores and other uses $2000.00
1—38" Board Slitter & Rewinder Shear Cut $1250.00
1—Knowlton S. B. Winder complete 2 glue pots $2750.00
Extra glue pots, etc. etc.

Many other items Tube Machinery

THEO. ADAMS
111 W. Washington St., Chicago, Ill.
R.A. 6-3558

D-16

FOR SALE

57" Oswego Power Paper Cutter Rebuilt and Guaranteed

AMERICAN GRAPHIC ARTS MACHINERY CO., INC.
38-02 22nd Street N. Y. C., N. Y. D 16

FOR SALE

One 48" Langston Double Shaft Slitter & Rewinder. "Good Condition." Address Box 48-797, care Paper Trade Journal.

D-16

FOR SALE—9 roll supercalendering machine, for handling material up to 55" wide. Made by Textile Machinery Co. of Providence, R. I. Complete with 100 H.P. Alternating Current motor. Address Box 48-799 care Paper Trade Journal. D-23

FOR SALE—MOTORS

Our No.	Description
#1WM	1/6 H.P., Diehl Mfg. Co., 115V., 1620 R.P.M., Type 125.
#2WM	1½ H.P., Watson, 110V. D.C., 1800 R.P.M., Form B.
#3WM	2 H.P., G. E., 115V. D. C., 1700 R.P.M., Type RC-24, Form A-9.
#10AM	2 H.P. Diehl Mfg. Co. 1740 R.P.M., 550V., 3 Phase—60.
#4WM	3 H.P., G.E., 115V., D.C., 1750 R.P.M., Type BD-45, Form A.
#1AM	3 H.P., Crocker-Wheeler C.C., 115V., 1150 R.P.M.
#5WM	3 H.P., Allis-Chalmers, 110V., 1025 R.P.M., No. 76764.
#2AM	5 H.P., Western Electric-Comp. Wound D.C., 115V., 1700 R.P.M.
#6WM	5 H.P., Lundell, 115V., 1070 R.P.M., No. 27265H.
#3AM	7½ H.P., G.E. Continuous Current-Shunt Wound D.C., 115V., 825 R.P.M.
#7WM	7.5 H.P., Westinghouse Adjustable Speed D.C., 115V., 650-1300 R.P.M., Type SK #70.
#4AM	10 H.P., Koltzer-Cabot, 110V., 800 R.P.M., D.C.
#1HM	10 H.P., G. E. Induction Motor, 220V., 1800 R.P.M., Type IS-4-10A-1800, Form KG.
#2HM	10 H.P., Wagner Elec. Co., 110/220V., 1750 R.P.M.-60 Cycle-Single Phase, Amps 115/48, Type 6, Model B-A.
#3HM	10 H.P., Vertical, Louis Allis Co. Self-Starting, 440V., 580 R.P.M. 60 Cycle-3Phase-Form B, Type X.
#5AM	15 H.P., Westinghouse, 110V., 1150 R.P.M.
#4HM	15 H.P., G.E. Induction Motor, 440V., 60 Cycle, R.P.M. 900/865, Form L, Type I.
#5HM	15 H.P., G.E. Induction Motor, 220/440, 1750 R.P.M.-60 Cycle-3 Phase. Frame 326 Type K.
#6HM	15 H.P., G.E. Induction Motor, 440V.-60 Cycles, 900/865 R.P.M., Type I, Form L.
#8WM	17 H.P., G.E. Induction Motor, 550V., 40 Cycles, 1200 R.P.M., Type I, Form L.
#9WM	20 H.P., G.E. Induction Motor, 550V., 40 Cycles, 800 R.P.M., Type I, Form L.
#10WM	20 H.P., G.E. Induction Motor, 550V., 40 Cycles, 800 R.P.M., Type I, Form L.
#11WM	20 H.P., G.E. Induction Motor, 550V., 40 Cycles, 600/580 R.P.M.
#6AM	35 H.P., G.E. Continuous Current D.C., 115V., 600 R.P.M.
#12WM	40H.P., G.E. Induction Motor, 550V., 40 Cycles, 600 R.P.M., Type I, Form L.
#13WM	40 H.P., G.E. Induction Motor, 550V., 40 Cycles, 800 R.P.M. Type I, Form L.
#9HM	40 H.P., G.E., Type KT, 1145 R.P.M., 440V.
#7AM	40 H.P., Westinghouse Squirrel Cage Induction, 220V., 3/60, 850 R.P.M. Full load, 10.5 Amps. Type CCL.
#9AM	50 H.P., G.E. Squirrel Cage Induction, 2200v., 3/60, 695 R.P.M., 12 Amps., Type I,
#8AM	50 H.P., G.E. Squirrel Cage Induction, 2200V., 3/60, 575 R.P.M., 12 Amps., Type I, Form K.
#14WM	50 H.P., G.E. Induction Motor, 550V., 50 Amps., 800 R.P.M., Type I, Form K.
#15WM	60 H.P., G.E. Induction Motor, 550V., 40 Cycles, 1200 R.P.M., Type I.
#8HM	75 H.P., G.E. Induction Motor, 440V.-3 Phase-60 Cycles, 690 R.P.M., Type IM.
#10HM	75 H.P., Triumph-Vertical Induction Motor-1750 R.P.M., Type TR-13, 440V.
#16WM	85 H.P., G.E. Induction Motor, 550V., 40 Cycles, 800 R.P.M., Type KT 85, Form L.
#17WM	150 H.P., Westinghouse Synchronous, 440V., 60 Cycles-3 Phase, 360 R.P.M.
#18WM	150 H.P., G.E. Synchronous, 440V., 60 Cycles, 450 R.P.M., Type TS, Form AL.
#19WM	200 H.P., Ideal Elec. Mfg. Co., 550V., 40 Cycles, 585 R.P.M., Form AV.

STARTING EQUIPMENT

Our No.	Description
#1AS	½ H.P., G.E. Regulating Rheostat, 110 Volts.
#2AS	6 H.P., Cutler-Hammer Starting Rheostat, 115 Volts, 24 Amps.
#3AS	5 H.P., Starting Rheostat, 115 Volts, G.E.
#1HS	5—15 H.P., Compensator, 440 Volts /60 Cycle /3 Phase.
#2HS	5—15 H.P., Compensator, 440 Volts /60 Cycle /3 Phase.
#3HS	5—15 H.P., Compensator, 440 Volts /60 Cycles /3 Phase.
#4AS	7½ H. P., Starting Rheostat, 115 Volts G.E.
#5AS	10 H.P., Starting Rheostat, 115 Volts G.E.
#6AS	10 H.P., Starting Rheostat, 115 Volts-Cutler-Hammer, 75 Amps.
#7AS	20 H.P., Starting Rheostat, 115 Volts G.E.
#4HS	20—25 H.P., Compensator, 440 Volts /60 Cycle /2 & 3 Phase.
#8AS	35 H.P., Starting Rheostat, 110 Volts G.E.
#1MS	40 H.P., G.E. Compensator, 440 Volts /60 Cycles /3 Phase.

GENERATORS

Our No.	Description
#1WG	7.5 H.P., Generator, G.E. Continuous Current, Comp. Wound, 125V., 96 Amps, 1800 R.P.M., Type CVC 7½, Form A1002, No. 193434.
#1AG	45 K.W.—G.E. D.C. Generator, 360 Amps—Continuous Current, 975 R.P.M., 120/125 Volts.
#2AG	60 K.W., D.C. Generator, 480 Amps—Continuous Current, 120/125.
3AG	75 KWA, Generator, 2400 Volts-3 Phase-60 Cycles, 900 R.P.M.
#2WG	200 H.P. Generator, G.E., 550 Volts AC, 289 Amps, 300-400 R.P.M., Form A, No. 58006.

MISCELLANEOUS

Our No.	Description
#1WC	Rotary Converter-Janette Mfg. Co., .2 D.C. KVA, 125 Volts, 1500 R.P.M. 2.7 Amps. Type CB 12, No. 256485.

For Information: Inquire **Ashland Paper Mills Inc., 220 E. 42 Street, N. Y. C. 17, N. Y.**

FOR SALE

5—48" x 160" Pusey & Jones Dryers tested for 50# pressure.

23—36" x 84" NEW Moore & White Dryers tested for 50# pressure.

13—36" x 68" Rice Barton Dryers with frames & gears.

1—Sturtevant Bale Pulper complete with conveyor, speed reducer, etc.

4—Dilts 2000# Beaters with Keyed Type Bandless Rolls 66" x 60". Cast Iron Tubs.

2—E. D. Jones 67" x 60" Beater Rolls complete with 2500# tubs if desired.

2—55" x 52" Beater Rolls complete with 1200#-1500# tubs.

1—44" x 44" Beater Roll, newly filled, complete with 1200# tub.

2—Noble & Wood Mammoth Jordans. New fillings to suit customer.

1—Noble & Wood Mammoth Jr. with New filling, and spare plug shaft.

1—No. 1 Claflin Refiner.

1—Shartle High Speed Refiner with anti-friction bearings.

3—Warren 10" x 4" open impeller Centrifugal Stock Pumps, 200 GPM at 60', antifriction bearings, designed for direct connecting.

1—Gould 8" x 6" Centrifugal Stock Pump, Antifriction bearings, 1000 G.P.M. at 105' head.

1—Morris Machine Works Centrifugal Stock Pump, 800 G.P.M. at 50' Head. New Casing, shaft & impeller.

2—Warren Low Head Circulating Pumps, 800 G.P.M. at 22' head.

1—Rubber covered press Roll 25" x 167" face.

1—Rubber Covered Press Roll 27" x 148" face with over 1" of New Rubber.

3—Rubber Covered Press Rolls 153/4" x 106".

1—Rubber Covered Couch Roll 16" Dia. x 91" Face, excellent condition.

2—Rubber Covered Couch Rolls 16" x 85".

1—Five Roll 96" Calender Stack, bottom roll 21" Dia.

1—36" x 86" Cylinder Mould.

1—36" x 76" Hollow Shaft Cylinder Mould.

1—Brass Breast Roll 20" x 170" face.

1—Rubber Covered Breast Roll 16" x 156" face.

1—NEW DeLaval Worm Reduction Gear, Ratio 9 3/5-1, Class 1, 10.5 H.P., 1160 RPM.

1—Coombs Gyratory Riddle.

1—G.E. Double End Motor, 175 H.P. Model No. 95 E 251 GI, Cont. 40° Type MT 559 Y6-175-1200 Form EL 220 Volts, 3 Phase, 60 Cycle, Amp.—400, Full Speed—1175 RPM, No. 5260733.

1—G.E. 100 HP Motor, Model No. 95 F 18 GI, Type MT 553-6-100-1200, Form EL, 220 Volts, 3 Phase, 60 Cycle. Sec. Amps 125, Speed 1165 RPM.
Both the above motors have 1—G.E. AC Magnetic Controller Service Induction Motor Starter, C. R. 7122 Y 1, Dia. 1 2835295 DL—38889467.

1—G.E. Synchronous Motor, 100 H.P., 3 Phase, 60 Cycle, 720 RPM.

1—G.E. Slip Ring, 100 H.P., 440 Volt, 60 Cycle, 3 Phase, 450 RPM Motor.
Both of the above motors newly rewound!

"Every Pound of Paper is Made on Used Equipment"

OSBORNE
PAPER MILL EQUIPMENT CORP.
Fulton, New York **Tel. 54**
D-16

BONDING — SLITTING — WAXING

Board—Felt—Paper—Foils—Combinations

Modern equipment and large capacity for bonding or laminating paper and foils to heavy board; slitting heavy board stock in rolls; waxing boards and combinations. Rail, truck or water transportation. Write or phone for complete information.

IRVINGTON VARNISH & INSULATOR CO.
IRVINGTON 11 **NEW JERSEY**
D-9

FOR SALE

FOR SALE

Paper Power Cutters; Slitters & Rewinders; Die Cutters; Printers; Scorers & Creasers; Gluers & Wrappers; Coaters; Laminators; Waxers; Stitchers; Brightwoods.

Write for latest bulletin listing available paper box & paper converting machinery. Get on our permanent mailing list for up-to-date inventory.

SOUTH WABASH ENGINEERING CO.
2929 So. Wabash Ave.
Chicago 16, Ill.
TF

FOR SALE

3—36" x 55"
Smallwood Pulp Stones
Never Used—Immediate Delivery
Reply to Box 48-806
c/o Paper Trade Journal D-23

FOR SALE—One used Allis Chalmers Streambarker, in good condition. Address Box 48-787 care Paper Trade Journal. D-16

FOR SALE—One 40" Kidder Slitter—SL Model in good condition, with motor and extra equipment. Address Box 48-765 care Paper Trade Journal. D-16

PAPER COATING MACHINERY—Waxing, Oiling, Carbon, Laboratory Coating and Treating Machines. New improvement. MAYER MACHINE COMPANY, Inc., 1313 Buffalo Road, Rochester, 11, N. Y. TF

FOR SALE—Embosser, B. F. Perkins, 45" now in full operation. Complete including steel engraved roller and two paper rollers unwind and rewind. $3500.00. Selling to make room for new machine. Joseph M. Katz & Company, Paper Square, Pittsburgh, 6, Pa. D-23

FOR SALE—One 30" Fales Model "C" Slitter with Variable Speed Motor. Additional equipment includes several different width sets of knives such as 3/8", 1 1/8", 1 3/8". Address Box 48-764 care Paper Trade Journal. D-16

FOR SALE—For immediate delivery. One 72" Electric Economy Baler, completely overhauled with new parts. Located at Boston, Massachusetts. Address Box 48-772 care Paper Trade Journal. D-16

FOR SALE—58" Finley Sheeter with six roll double deck back stand. Rebuilt and guaranteed. Address Box 48-800 care Paper Trade Journal. D-23

WANTED

WANTED: TRIMMER

72" or wider heavy duty type in good condition for board mill use. Address: John Schuster, Miamisburg Box Board Div., Miamisburg, Ohio, Phone 778 D-30

WANTED

One 2 drum vertical reel, complete with back stands, flanged pulleys, idlers with adjustments and friction clutches. Drums to be spaced to wind approximate 66" diameter. Drums, minimum of 16" in diameter and 90" face. Bottom drum to be removable.
Address Box 48-804 care Paper Trade Journal.
D-30

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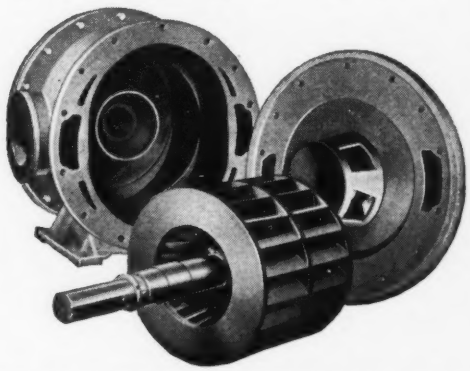

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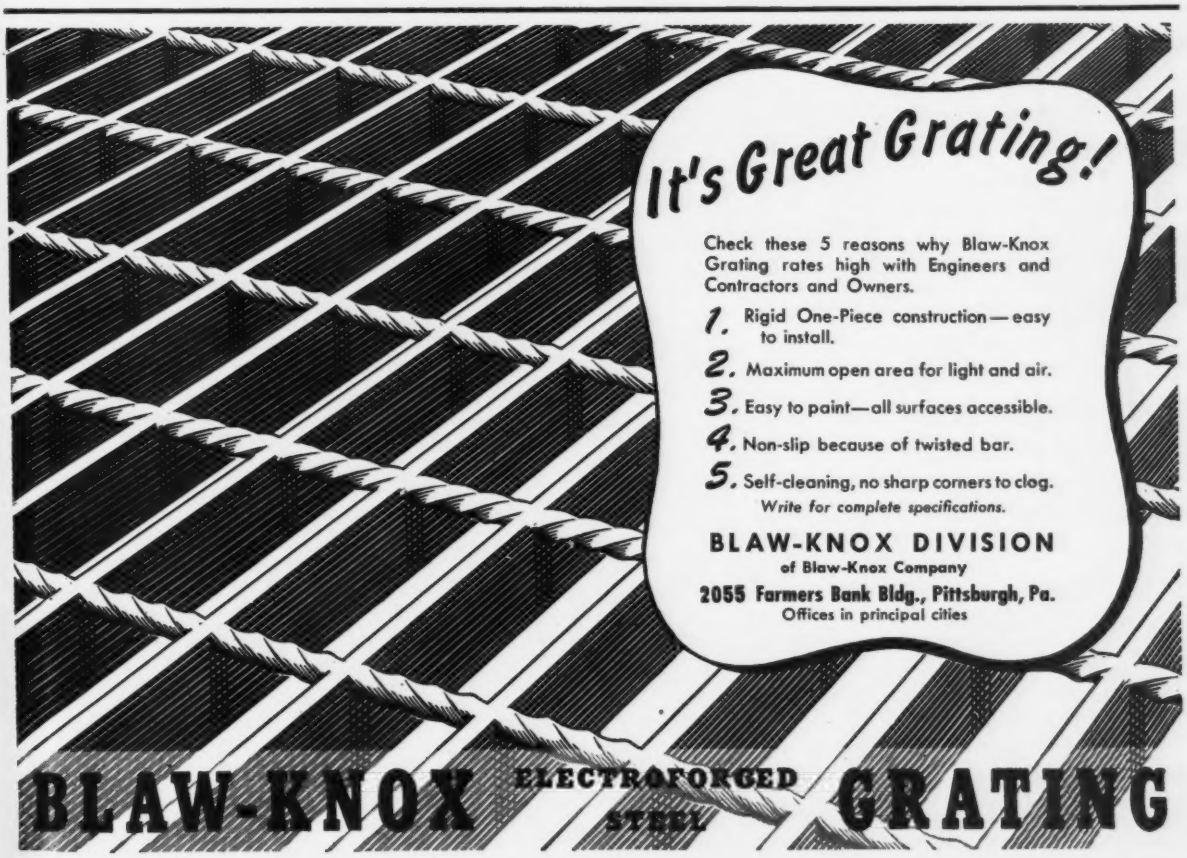
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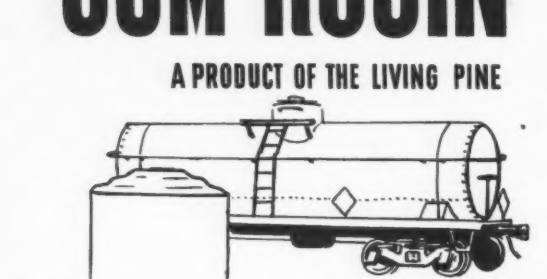

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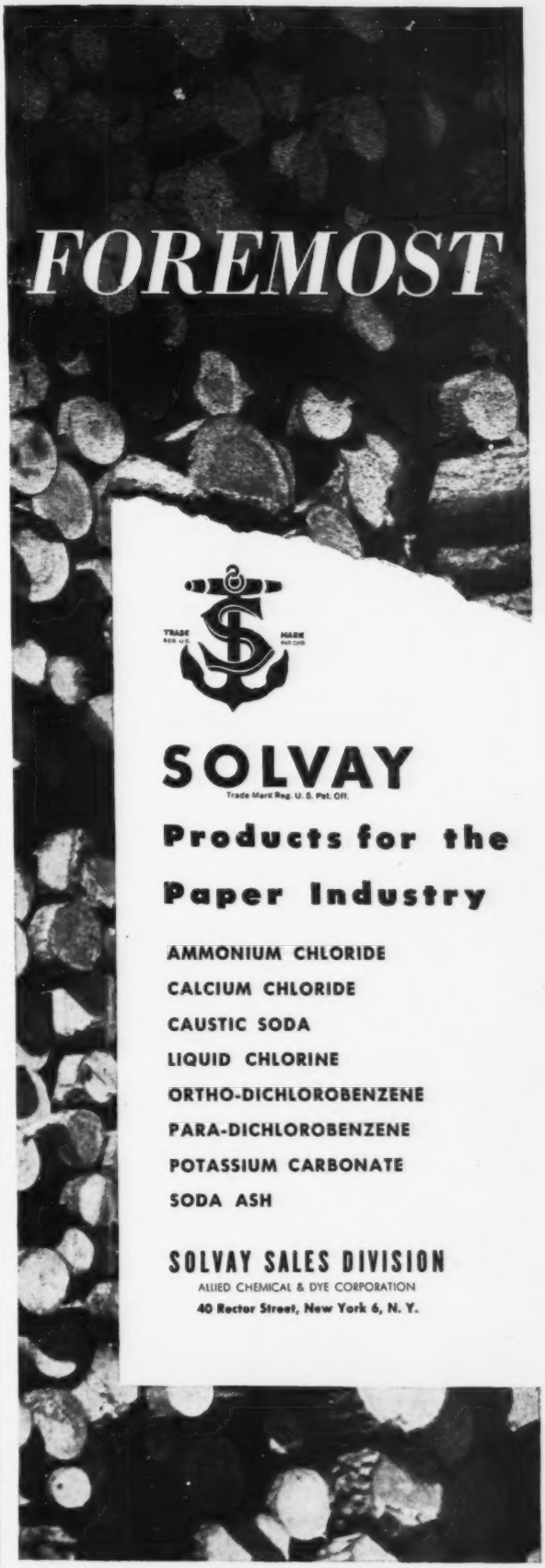

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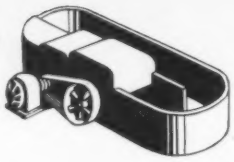

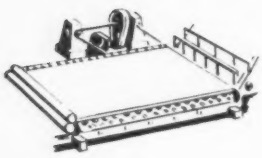

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Downingtown Mfg. Co.
The Moore & White Co.
Noble & Wood Machine Co.
Oliver United Filters, Inc.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

Friction Materials
Johns-Manville Sales Corp.
Raybestos-Manhattan Inc., Manhattan Rubber Division

Freeness Testers
Testing Machines, Inc.

Gaskets
The Goodyear Tire & Rubber Company
Raybestos-Manhattan Inc., Manhattan Rubber Division

Gears
Black-Clawson Company
Downingtown Mfg. Co.
Frank W. Egan & Co.
Farrel-Birmingham Co.
E. D. Jones & Sons Co.
Link Belt Company
Moore & White Co.
D. J. Murray Mfg. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Suburban Machine Co.
Valley Iron Works Co.
Waldron Corp., John
Westinghouse Electric Corp.

Grinders
Carthage Machine Co.
Farrel-Birmingham Co.
Gibbs-Brower Company, Inc
Lobdell Co.
Norton Company
Samuel C. Rogers and Company
The Sandy Hill Iron & Brass Works

Grinding Wheels
The Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc.
Norton Company

Guides, Web
Gilbert & Nash Co.
The Moore & White Co.
Mount Hope Machinery Co.
Bound Brook Engrg. Co.

Gums
National Starch Products Inc.
Stein-Hall Co., Inc.

Heads
Babcock & Wilcox Co.
Lukens Steel Company

Heat Exchangers and Recovery Systems
William Allen Son's Company
Foster Wheeler Corp.
Stickle Steam Specialties Co.
Westinghouse Electric Corp.

Heating, Ventilating & Air Conditioning
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Armstrong Machine Works
Cochrane Corp.
E. D. Jones & Sons Co.
General Electric Co.
Leeds & Northrup
Minneapolis-Honeywell Regulator Co.
D. J. Murray Mfg. Co.
Red-Ray Mfg. Co., Inc.
Ross Engineering Corp., J. O.
Stickle Steam Specialties Co.
Valley Iron Works Co.
Westinghouse Electric Corp.

Hoists
Appleton Machine Co.
Rodney Hunt Machine Co.
Ingersoll-Rand Co.
E. D. Jones & Sons Co.

Hose (Air, Water, Suction, etc.)
The Goodyear Tire & Rubber Company
Raybestos-Manhattan Inc., Manhattan Rubber Division

Impregnants
American Anode Div., The B. F. Goodrich Chem. Co.

Industrial Tractors
Clark Equipt. Co., Clark Tractor Div.
Towmotor Corp.

Instruments, Testing and Measuring
Bauer Brothers Co.
N. P. Bowsher
The Bristol Company
The Brown Instrument Co.
Cady & Co., E. J.
Cochrane Corp.
The Foxboro Company
General Electric Company
W. & L. E. Gurley
Leeds & Northrup Company
National Technical Laboratories
B. F. Perkins & Son
Taylor Instrument Cos.
Testing Machines, Inc.
Wallace & Tiernan Instrument Co.
Williams Apparatus Co., Inc.

Joints
Johnson Corp.
Perfecting Service Corp.

Jordan Fillings
Appleton Machine Co.
Bahr Brothers Mfg. Co.
E. D. Jones & Sons Co.
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

Knives
Black-Clawson Company
Dilts Machine Works, Inc.
Hamblet Machine Co.
Heppenstall Company
E. D. Jones & Sons Co.
The Moore & White Co.
Taylor Stiles & Co.
Valley Iron Works Co.

Knot Boring Machines
DeZurik Shower Company

Laboratory Equipment
William Allen Son's Company
Appleton Machine Co.
Bauer Brothers Co.
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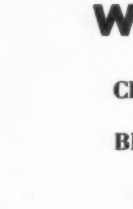

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Socony-Vacuum Oil Co.
Sun Oil Company
The Texas Company
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Montague Machine Co.
Lobdell Co.
Testing Machines, Inc.
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Stickle Steam Specialties Co.

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Ingersoll-Rand Co.
Reliance Electric & Engrg. Co.

Moulds
Cheney Bigelow Wire Works

Nickel and Nickel Alloys
The International Nickel Co.

Nozzles
Link Belt Company

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The Moore & White Co.
Perfecting Service Corp.
Shartle Brothers Machine Co.

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The Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc.

Paint
American Marietta Co., Valdura Division

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Black-Clawson Company
Downingtown Mfg. Co.
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Thomas W. Hall Co.
Lukenweld
Moore & White Co.
Pusey & Jones Corp.
J. J. Ross Company
Ross Paper Machy. Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.

Paper Machine Slices
Black-Clawson Company
E. D. Jones & Sons Co.
The Moore & White Co.
The Sandy Hill Iron & Brass Works
Valley Iron Works Co.

Paper Tube Machinery
Dietz Machine Works
Gibbs-Brower Company, Inc.
Thomas W. Hall Co.
Hudson Sharp Machine Co
Langston Co., Samuel M.
Suburban Machine Co.

Pasting Machines
Black-Clawson Company
Davis, Frank H., Co.
Dilts Machine Wks.
Frank W. Egan & Co.
Gibbs-Brower Company, Inc.
Murray, D. J., Mfg. Co.
Moore & White Co.
Potdevin Machine Co.
Shartle Brothers Machine Co.
Waldron Corp., John

Penstocks
The Biggs Boiler Works Co.

Where to

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Allis-Chalmers Mfg. Co.
Harrington & King Perforating Co.

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Armco Drainage & Metal Products, Inc.
Babcock & Wilcox Co.
Crane Company
Johns-Manville Sales Corp.
Ladish Company
Michigan Steel Casting Co.
Stowe-Woodward, Inc.
Walworth Company
Youngstown Welding & Engrg. Co.

Pipe Fittings
American Cast Iron Pipe Co.
The American Rolling Mill Co.
Crane Company
Ladish Company
Michigan Steel Casting Co.
Phoenix Products Co.
Walworth Co.

Pitch Control
General Dyestuff Corp.
Monsanto Chemical Company
Rohm & Haas Co.

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Perkins & Son, Inc., B. F.

Plates
Armco Drainage & Metal Products, Inc.
Babcock & Wilcox Co.
The Biggs Boiler Works Co.
J. O. Ross Engrg. Corp.
Lukenweld
Lukens Steel Company
Timken Roller Bearing Co.

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Black-Clawson Company
E. D. Jones & Sons Co.
Shartle Brothers Machine Co.

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Testing Machines, Inc.

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General Dyestuff Corp.

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William Allen Son's Company
Babcock & Wilcox Co.
The Biggs Boiler Works Co.
Combustion Engrg. Co., Inc.
General American Transportation Corp.
Foster Wheeler Corp.
The Midvale Company

Presses
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Dietz Machine Works
Farrel-Birmingham Co.
Gibbs-Brower Company, Inc.
Thomas W. Hall Co.
Hudson-Sharp Machine Co.
The Moore & White Co.
Paper Converting Machine Co., Inc.
Potdevin Machine Co.
Shartle Brothers Machine Co.
Valley Iron Works Co.
Waldron Corp., John
H. G. Weber & Co., Inc.
Williams Apparatus Co.

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The Bauer Bros. Co.

Pulp Stock Valves
Crane Company
Record Fdy. & Mach. Co.
Shartle Bros. Mach. Co.

Pulpers
Bauer Brothers Co.
Dilts Machine Works
Shartle Brothers Machine Co.

Pulps
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Bulkley, Dunton Pulp Co., Inc.
Gottesman & Co., Inc.
Elof Hansson, Inc.
Lydden & Co. (America), Inc.
Parsons & Whittemore, Inc.

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Price & Pierce, Ltd.
Pulp and Paper Trading Co.
Pulp Sales Corp.

Pulpstones
Norton Company

Pumps
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American Paper Mchy. & Engrg. Works, Inc.
American Well Works
Black-Clawson Company
Buffalo Pumps, Inc.
Byron Jackson Co.
Dorr Company
Downingtown Mfg. Co.
Fairbanks, Morse & Co.
Frederick Iron & Steel, Inc.
Gibbs-Brower Company, Inc.
Ingersoll-Rand Co.
Johnson Corp.
Moore & White Co.
Nash Engineering Co.
Paper Converting Mch. Co.
J. J. Ross Company
Ross Paper Machy. Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Warren Steam Pump Company

Radiant Burners
Red-Ray Mfg. Co., Inc.

Rag Cooking Processes
Adell Chemical Co.
William Allen Son's Company
The Kinsley Chemical Company
General Dyestuff Corp.
Rohm & Haas Co.

Rag Cutters
Gibbs-Brower Company, Inc.
B. F. Perkins & Son, Inc.
Taylor-Stiles & Co.

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Recovery Systems
William Allen Son's Company
American Well Works
Babcock & Wilcox Co.
Bulkley, Dunton Pulp Co., Inc.
Combustion Engrg. Co., Inc.
Rodney Hunt Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
Pusey & Jones Corp.
Ross Engineering Corp., J. O.
Valley Iron Works Co.

Reels
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Black-Clawson Company
Downingtown Mfg. Co.
Hudson Sharp Machine Co.
Moore & White Co.
Paper Converting Mch. Co.
Rodney Hunt Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
The Smith & Winchester Mfg. Co.

Refiners
Appleton Machine Co.
Bahr Brothers Mfg. Co.
Bauer Brothers Co.
Dilts Machine Works
Gibbs-Brower Company, Inc.
The Hermann Mfg. Co.
E. D. Jones & Sons Co.
Morden Machines Co.
Murray, D. J., Mfg. Co.
Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Sutherland Refiner Corp.
Valley Iron Works

Regulators
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American Paper Mchy. & Engrg. Works, Inc.
Armstrong Machine Works
Bird Machine Company
The Bristol Company
Cochrane Corp.
DeZurik Shower Company
The Foxboro Company
Jones, E. D., & Sons Co.
General Electric Co.
Johnson Corp.
Leeds & Northrup Company
Minneapolis-Honeywell Regulator Co.
National Technical Laboratories
Paper and Industrial Appliances
Shartle Brothers
Stickle Steam Specialties Co.
Taylor Instrument Companies
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Resins
American Cyanamid Company, Industrial Chemicals Division
The Dow Chemical Company
The Goodyear Tire & Rubber Company
Hercules Powder Co.
Monsanto Chemical Company
Reichhold Chemicals, Inc.
The Resinous Prod. & Chem. Co.

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Appleton Machine Co.
Black-Clawson Company
H. W. Butterworth & Sons Co.
Downingtown Mfg. Co.
Frank W. Egan & Co.
Farrel-Birmingham Co.
Gibbs-Brower Company, Inc.
Lobdell Co.
The Midvale Company
The Moore & White Co.
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
Perkins, B. F., & Sons Co.
Pusey & Jones Corp.
Raybestos-Manhattan Inc., Manhattan Rubber Division
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Rodney Hunt Machine Co.
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Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Stowe-Woodward, Inc.
Valley Iron Works Co.
Waldron Corp., John
The Youngstown Welding & Engrg. Co.

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The Cincinnati Rubber Mfg. Co.
The Goodyear Tire & Rubber Company
Raybestos-Manhattan Inc., Manhattan Rubber Division
Stowe-Woodward, Inc.

Roll Stands
Cameron Machine Co.
Frank W. Egan & Co.
Moore & White Co.
Potdevin Machine Co.
John Waldron Corp.
H. G. Weber & Co., Inc.

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Rope Carriers
The Moore & White Co.

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The Biggs Boiler Works Co.

Rotary Steam Joints
Johnson Corp.
The Moore & White Co.
Perfecting Service Corp.

Rubber Products
The Goodyear Tire & Rubber Company
Raybestos-Manhattan Inc., Manhattan Rubber Division
Stowe-Woodward, Inc.

Saturants
American Anode Div., The B. F. Goodrich Chem. Co.

Saturating Machines
Black-Clawson Company
Frank W. Egan & Co.
Gibbs-Brower Company, Inc.
Moore & White Co.
Noble & Wood Machine Co.
Potdevin Machine Co.
Shartle Brothers Machine Co.
Waldron Corp., John
Weber, Herman G.

Savealls
Bird Machine Company
Hardinge Company

Scales
Fairbanks, Morse & Co.
Merrick Scale Mfg. Co.
Testing Machines, Inc.
Walker-Goulard-Plehn Co.

Screen Plates
Bird Machine Company
Fitchburg Screen Plate Co.
Magnus Metal Corp.
Morey Paper Mill Supply Co.
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Link Belt Company
Moore & White Co.
D. J. Murray Mfg. Co.
J. J. Ross Company
Ross Paper Machy. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Trimbey Mach. Wks.
Valley Iron Works Co.

Sheet Machines
Gibbs-Brower Company, Inc.
Thomas W. Hall Co.
The Hermann Mfg. Co.
Noble & Wood Machine Co.
Suburban Machine Co.
Valley Iron Works Co.

Shower Pipes
Bird Machine Company
A. E. Broughton & Co.
DeZurik Shower Company
Downingtown Mfg. Co.
Moore & White Co.
Sandusky Fdy. & Mch. Co
Shartle Bros. Mach. Co.
Smith & Winchester Mfg. Co.

Shredders
Bauer Brothers Co.
Carthage Machine Co.
Gibbs-Brower Company, Inc.

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Black-Clawson Company
The Dow Chemical Company
du Pont, E. I., de Nemours & Co.
Glidden Company
Hercules Powder Co.
Monsanto Chemical Company
National Aluminate Corp.
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General Dyestuff Corp.
Mallinckrodt Chemical Wks.
National Aluminate Corp.
Rohm & Haas Co.

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Cameron Machine Co.
Carthage Machine Co.
Dietz Machine Works
Downingtown Mfg. Co.
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Gibbs-Brower Company, Inc.
Thomas W. Hall Co., Inc.
Hamblet Machine Co.
Hudson Sharp Machine Co.
Langston Co., Samuel M.
Machinery & Prod. Engrg. Corp.
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Ingersoll Steel Div., Borg-Warner Corp
Michigan Steel Casting Co.
The Midvale Company
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Clinton Industries, Inc.
National Starch Products Inc.
Stein-Hall Co., Inc.

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The Moore & White Co.

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Combustion Engrg. Co., Inc.
Johnson Corp.
Perfecting Service Corp.
Shartle Bros. Mch. Co.
Stickle Steam Specialties Co.

Steel
American Rolling Mill Co.
Carnegie Illinois Steel Co.
Ingersoll Steel Div., Borg-Warner Corp.
Lukens Steel Company
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
U. S. Steel Corp.

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Lukens Steel Company

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Moore & White Co.
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E. D. Jones & Sons Co.
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

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Texas Gulf Sulphur Co.
Witco Chemical Company

Sulphur Burners
Valley Iron Works Co.

Sulphur Dioxide
Ansul Chemical Company
Virginia Smelting Co.

Supercalenders
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B. F. Perkins & Son, Inc.

Synthetic Latices
American Anode Div., The B. F. Goodrich Chem. Co.
The Goodyear Tire & Rubber Company
Nopco Chemical Co.

Tachometers
The Brown Instrument Co.

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W. H. Loomis Talc Corp.

Tank Cars
General American Transportation Corp.

Tank Cleaning Tools
Aurand Mfg. & Equipt. Co.

Tanks
William Allen Son's Company
The Biggs Boiler Works Co.
Cochrane Corp.
General American Transportation Corp.
E. D. Jones & Sons Co.
Kalamazoo Tank & Silo Co.

to Buy

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B. F. Perkins & Son, Inc.
J. O. Ross Engrg. Corp.
Shartle Brothers Machine Co.
Stowe-Woodward, Inc.
Waldron Corp., John

Tearing Testers
Testing Machines, Inc.

Tensile Testers
B. F. Perkins & Son, Inc.
Testing Machines, Inc.

Thickeners, Deckers and Savealls
American Well Works
The Appleton Machine Co.
Bird Machine Company
Bulkley, Dunton Pulp Co., Inc.
Carthage Machine Co.
Cheney Bigelow Wire Works
Dilts Machine Works
Dorr Co.
Downingtown Mfg. Co.
General American Transportation Corp.
Hardinge Co., Inc.
Improved Paper Machy. Corp.
Moore & White Co.
D. J. Murray Mfg. Co.
Oliver United Filters, Inc.
J. J. Ross Company
Ross Paper Machy. Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

Titanium
E. I. du Pont de Nemours & Co.
Titanium Pigment Co.
R. T. Vanderbilt Co.
Witco Chemical Company

Tools
Ingersoll-Rand Co.
The Stanley Works
Walworth Company

Tractors & Trucks
Towmotor Corp.
Clark Equipt. Co., Clark Tractor Div.

Transmissions
Link Belt Company

Traps
Armstrong Machine Works
Cochrane Corp.
Crane Co.
Johnson Corporation
Shartle Bros. Mch. Co.
Stickle Steam Specialties Co.

Tubes
Babcock & Wilcox Co.

Tubs
Rodney Hunt Machine Co.
Noble & Wood Machine Co.
Shartle Brothers
Valley Iron Works Co.

Turbines
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
General Electric Company
Hunt, Rodney, Mach. Co.

Turpentine Recovery
Foster Wheeler Corp.

Used Equipment
Frank H. Davis Company
Gibbs-Brower Co.
Thomas W. Hall Co.
J. J. Ross Company
Ross Paper Machy. Corp.
Shartle Brothers Machine Co.
Suburban Machine Co.

Valves
The Bristol Company
The Brown Instrument Co.
Cochrane Corp.
Crane Company
Dilts Machine Works
The Foxboro Company
E. D. Jones & Sons Co.
Magnus Metal Corp.
D. J. Murray Mfg. Co.
William Powell Co.
Record Fdy. & Mch. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Stickle Steam Specialties Co.
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Trimbey Mach. Wks.
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Rodney Hunt Machine Co.
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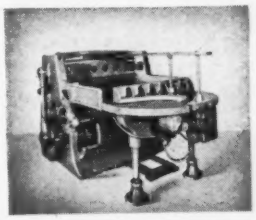

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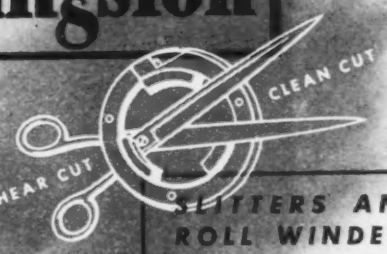

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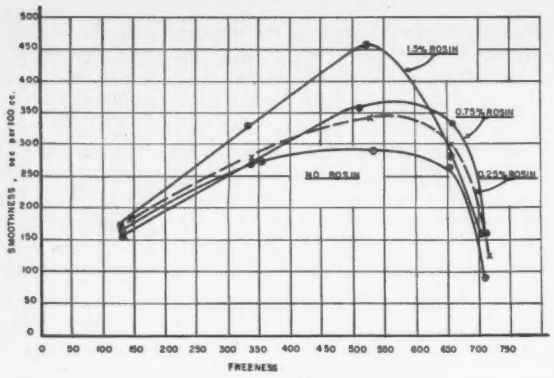

FIG. 10
Effect of Sheet Density on Smoothness

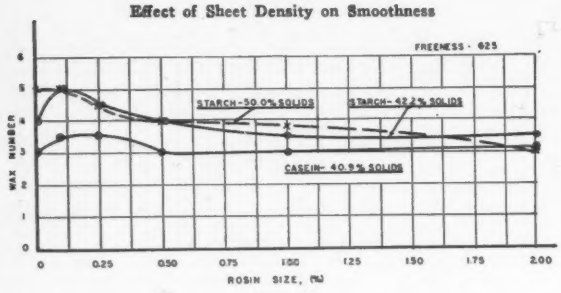

FIG. 11
Effect of Rosin Size on Wax Number

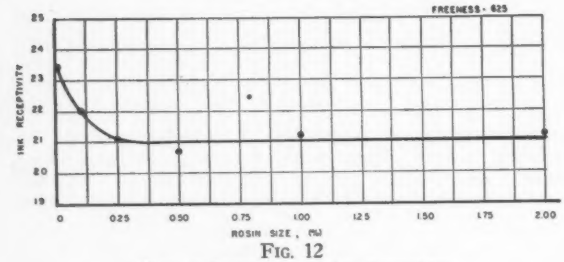

FIG. 12
Effect of Rosin Size on Ink Receptivity

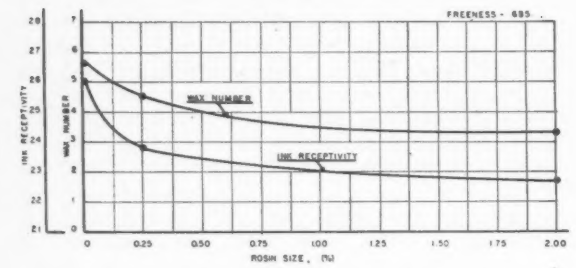

FIG. 13
Effect of Rosin Size on Wax Number and Ink Receptivity

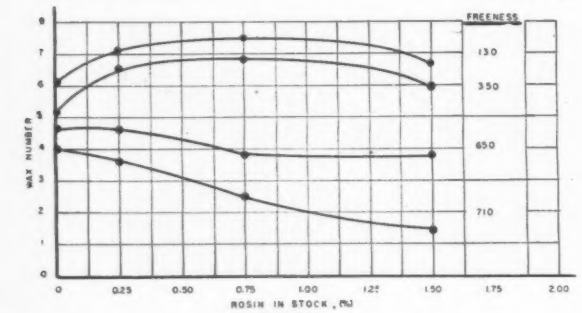

FIG. 14
Effect of Rosin Size on Wax Number

caused by the difference in the water retention of the coatings. The casein coating had a higher water retention (16.7 sec.) than either the polyvinyl alcohol (7.3 sec.) or the starch (13.7 sec).* It might be surmised that because of its high water retention, the casein coating has less tendency to penetrate into porous sheets, although there is no evidence to support this conclusion

EFFECT OF DENSITY ON WAX TEST, INK RECEPTIVITY, AND PENETRATION, USING SIZED PAPERS

Experiment No. 4 was carried out to determine the effect of density on sheets of constant sizing. In this case, 0.5% rosin and 1.25% alum were used, and heavy sheets (about 85 pounds) were made, using stock which ranged in freeness from 765 to 140ml. The coating weight was about 25 pounds. The sheets were examined under the microscope, and it was found that there was no significant difference in the depth of penetration on the high density and low density sheets. Apparently the presence of 0.5% rosin in the sheet was sufficient to offset any effect which would be expected due to differences in the densities of the sheets.

The ink receptivity values which were obtained in this experiment were obviously not true values since they did not agree well with a visual rating on the sheets. Since there was no appreciable difference in the color of the inked sheets according to the rating by eye, it was concluded that there was no noticeable effect in the ink receptivity.

The wax number was appreciably increased as the density was increased, although it remained reasonably constant from a freeness value of 140 to about 500 ml., as shown in Fig. 7. The shape of the curve in Fig. 7 differs from that in Fig. 6 because of the presence of 0.5% rosin in the base paper which apparently influences the wax number in the range of low sheet density.

Experiment No. 5 was carried out to show the effects of sheet density on the wax pick, ink receptivity, and amount of penetration, using sheets of different degrees of sizing. In this case, the base stock was 85 pounds and the coating weight was about 25 pounds. The results are plotted in Fig. 8. As far as the wax pick test is concerned, these results showed the same general effect as experiment No. 4 in that the wax test tended to increase as the density of the sheet was increased. One very interesting effect was that the decrease in wax test which occurred in the sheets of low density was greatest in the sheets of high rosin content. This could be caused by differences in the penetration although it might be a general weakening of the sheet brought about by the rosin. The ink receptivity was not greatly affected by changes in density although there was a tendency for a slight decrease as the density of the sheet was increased in the case of those sheets containing no rosin size.

The effect of sheet density on penetration in sheets containing two different percentages of rosin is shown in Table II as part of the data which is obtained in experiment No. 5. Photographs of these sheets are shown in Fig. 9. These results show that increasing the density decreased the amount of penetration slightly, which is at variance with the conclusion from experiment No. 4.

(To be concluded in December 23 issue)